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# SURGERY AND THE BASIC SCIENCES

## THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

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### SULPHANILAMIDE

SULPHANILAMIDE has proved to be an extremely effective chemotherapeutic agent in the treatment of streptococcic and gonococcic infections. Many recent papers have appeared which indicate that it is effective also in combating experimental pneumococcic infection. Cooper and Gross (1), in a series of articles, have reported good results in treating rats infected with pneumococci of Types I, III, and IV; Kreidler (2) in rabbits injected endermically with Type I; and Schmidt (3) in mice inoculated with Type XIV. The lung involvement is apparently not decreased, but treatment permits the animals to survive the associated "toxemia." Sulphanilamide appears to be as effective as specific antisera, although the therapeutic effect is not enhanced by including antisera in the treatment. Kelson (4) finds sulphanilamide ineffective in the treatment of monkeys inoculated intranasally with poliomyelitis.

Barlow (5) reports that oral therapy with sulphanilamide compounds is more effective than parenteral. He states that prontylin is from 1.4 to 1.8 times more effective than prontosil in experimental streptococcic infections, although prontylin has a narrower range between the therapeutic and toxic doses. Disulon has been proved to be the most effective and the least toxic of the three sulphanilamide compounds which were studied.

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Marshall, Emerson, and Cutting (6) have determined the sulphanilamide renal clearance in the dog, and found it to be from 20 to 30 per cent of the creatinine clearance. The drug is therefore reabsorbed to some extent by the renal tubules. The clearance is independent of the plasma level, but is increased by the rate of urine flow. These investigators also report (7) that in dogs and man sulphanilamide is distributed almost uniformly throughout the body, except for osseous and adipose tissues. The concentration in the cerebrospinal fluid parallels that in the blood, an observation also made by Mellon and Bombas (8) in cases of successfully treated streptococcic meningitis. This high degree of penetration of sulphanilamide is probably an important factor in its therapeutic effectiveness.

Although the acute toxicity of sulphanilamide has been determined, the first study to come to our attention on the pathology produced by continued administration of non-fatal doses is that of Hageman (9). In mice exposed to various doses, histological examination revealed no pathology in the kidney or liver. Deposition of hemosiderin in the spleen was noted, however, which suggested increased blood destruction. This process appeared to continue after withdrawal of the drug. Excessive numbers of eosinophils were observed in the bone marrow, which suggested the possibility of an allergic type of action, although no reactions were detected at the time of administration of the drug.

## THE ENDOCRINE SYSTEM

### THE MENSTRUAL CYCLE[1]

Within the past few years several reports have appeared on the excretion of estrogenic substances in the urine of women during the menstrual cycle (Gustafson, Wood and Hays, 10; Yerby, 11; Browne and Venning, 12; Smith and Smith, 13). These observations agree that in the midperiod, from thirteen to fifteen days after the onset of menstruation, i.e., at about the time of ovulation, there is a marked rise in the excretion of estrogens, and that there is a second smaller rise which appears just before the onset of menses. Palmer (14) has recently studied during the cycle the excretion of both the free form, estrone, which is physiologically the most active, and the combined form, estriol glycuronide (?), the less active. She found that during the follicular phase (the first fourteen days, during which time the follicle is developing) only the combined form is excreted. On the fourteenth or fifteenth day the combined form disappears to be replaced by a much greater quantity of free estrone. This is probably followed by ovulation. Within the next day or two the excretion falls to approximately the previous level, which is then maintained during the luteal phase, or the period following ovulation, during which the corpus luteum develops. On the day preceding menstruation the combined form is again replaced by an approximately equal amount of the more active free estrone.

Little has been known about the activity of the corpus luteum during the cycle because of failure to detect the presence of progesterone in the urine of normal women. Recently Venning and her co-workers (15, 16, 17) have offered evidence to prove that *progesterone is eliminated in a physiologically inactive form*, or as sodium pregnandiol glycuronidate. This is an important discovery because it explains the previous failures to detect the hormone by biological assay. A gravimetric method (Venning, 18), which has been developed to determine this compound in the urine promises to yield valuable information on the secretory activity of the corpus luteum. Applying this method and using mid-menstrual spotting and *mittelschmerz* as criteria for ovulation, Venning and Browne (19) have found that this inactivated progesterone is not present in the urine during the follicular phase of the menstrual cycle, but appears from twenty-four to forty-eight hours after ovulation has occurred. The excretion of the progesterone derivative then continues for the next ten or twelve days and disappears suddenly from one to three days before the onset of bleeding. These authors also noted in several cases of functional sterility that the excretion of progesterone was subnormal in amount and continued for only a few days. This observation conforms to our present concept that a functional corpus luteum is essential for implantation. The authors also noted that variations in the length of the cycle were due to variation in the length of the *follicular* phase, the *luteal phase* being comparatively uniform. The latter fact is the basis of the so-called "rhythm theory" of contraception.

These findings in the normal woman conform closely to the theory of menstrual bleeding as outlined by Zuckerman in a series of recent publications (20). This investigator has reproduced a normal twenty-eight-day cycle in the castrated monkey by administering female sex hormones. If one simulates the follicular phase of the cycle by injecting gradually increasing amounts of estrone for fourteen days and then withdraws the hormone, bleeding will occur from seven to eight days later. However, if instead of completely withdrawing the hormone, one merely reduces it to a certain subthreshold dose, menstruation follows on the twenty-eighth day. This procedure can be repeated indefinitely and regular bleedings at twenty-eight-day intervals, the normal cycle for the monkey, will result. This situation corresponds to the *anovulatory cycle*, involving no functional corpus luteum, which occurs frequently in monkeys and to an unknown extent in women. Phenomena corresponding to an ovulatory cycle (progestational changes in the endometrium) can be produced by superimposing the proper amount of progesterone during the second half of the cycle. Menstruation follows upon withdrawal of the progesterone. The events described here correspond very closely to those now believed to occur in the normal woman.

Concerning the forces which control the growth of the follicle and the cyclic nature of the process, some new information is available. It has previously been maintained that the follicle-stimulating hormone of the pituitary gland induces growth of the follicle and secretion of estrone, which in turn react on the pituitary gland to induce secretion of the luteinizing factor. This aids develop-

[1]In this review the nomenclature adopted by the Council on Pharmacy and Chemistry of the American Medical Association will be adhered to. Estrone=theelin; estriol=theelol; estradiol=dihydrotheelin; progesterone=hormone of corpus luteum; estrogen=generic term for compounds which produce estrus; androgen=generic term for substances possessing masculinizing activity.

ment of the corpora lutea, which produce progesterone. Estrone and possibly progesterone were thought to depress temporarily the elaboration of follicle-stimulating hormone from the pituitary gland. Removal of this depressing effect initiates the next cycle. This concept may be *slightly* changed as a result of recent work. It is reported by Myers, Young, and Dempsey (21) that the rate of growth of the follicle in the guinea pig is practically constant during the first twelve days of the sexual cycle and that just before estrus a sudden marked enlargement occurs. This sudden growth was shown by Foster and Hisaw (22) to be the effect of the luteinizing hormone of the anterior lobe of the hypophysis. Dempsey (23) reports that the basal growth rate of the follicle is altered neither by male and female sex hormones, nor by pregnancy, but is abolished by hypophysectomy, whence he concludes that it is controlled by a *constant* production of follicle-stimulating hormone from the pituitary gland. The sudden enlargement which culminates in ovulation is due to a sudden discharge of the luteinizing hormone, a discharge which he finds is prevented by progesterone and by pregnancy. He believes, therefore, that the cyclic nature of the phenomena of estrus derives, not so much from a variable secretion of follicle-stimulating hormone as from a periodic discharge of the luteinizing hormone, this discharge being brought about probably by estrone (Victor and Anderson, 25) and inhibited by progesterone.

A sudden discharge of gonadotropic hormone (anterior lobe of the hypophysis) has been noted by two groups of investigators who have detected the hormone in the urine on the day preceding ovulation in normal women (19, 24). This would appear to correlate well with observations in the lower animals as mentioned above. However, one cannot be too cautious when correlating findings in man with those in the lower animals. *One should never forget that of all the phenomena of physiology, those concerning reproduction show the greatest species differences.*

### IMPLANTATION

Brewer (27) has published a careful study of a fifteen-day-old human embryo with its accompanying uterus. He noted that the endometrium (vera) distant from the embryo showed a microscopic appearance identical with that of a fully developed endometrium of an ovulatory cycle. At the site of implantation, however, the endometrium had the appearance of a beginning menstruation of an ovulatory cycle. (For a recent review of the endometrial changes during menstruation, see Bartelmez, 28.) All of the necrosis in this area could not be attributed to the activity of ferments from the trophoblast. Some of the changes were due to vascular activity on the part of the endometrium, exactly as found in beginning menstruation, namely, constriction at the level of the myometrium of the spiral arteries which nourish the superficial mucosa. *The endometrium, therefore, appears to "menstruate" locally at the site of implantation*, at the time when menstruation would have appeared had impregnation not occurred. Brewer believes that the purpose of this localized bleeding is to provide nourishment for the embryo, which has not as yet established an adequate circulatory connection with the uterus. Bleeding at this time is well known among lower animals under the term, "placental sign." This same phenomenon occurs in man as this work shows. This sign in an exaggerated form accounts for the frequently observed "spotting" or menstruation at the first period following conception in women.

### OVULATION POTENTIAL

It has been reported that in rabbits the process of ovulation is reflected by a sudden marked change in the electric potential between the vagina and abdominal wall (29, 30). This method of investigation has been applied successfully to a woman who was to undergo an operation (Burr, Musselman, Barton, and Kelly, 31). The characteristic change of potential having been observed, the woman was operated upon and a fresh corpus luteum was found on the ovary. Reboul, Davis and Friedgood (32) showed in the rabbit that the change in potential occurred within a few seconds after ovulation, the latter being directly observed by means of a laparotomy. They also report that the contents of the developing follicle are electronegative with regard to the surrounding tissues. Since the typical change in potential is not observed if the rupturing ovary is electrically insulated except for its blood supply, nor if the follicular contents are removed and spilled into the abdomen, the authors conclude that the ovulation potential is due to the establishment of electrical contact between the electronegative interior of the ovary and the surrounding tissues, which makes the latter (the abdominal wall) more negative with respect to the vagina.

Although the long-debated question as to whether new germ cells are formed in the adult ovary or whether they are all preformed at birth is not directly related to this subject, it is interesting to observe that Allen and Creadick (33) have

apparently settled it. By means of colchicine, a drug which arrests cells in mitosis and thereby allows dividing cells to accumulate in numbers so as to be easily observed, they were able to show mitoses in the germinal epithelium of the adult mouse ovary, which proved that new germ cells continue to be formed in the ovary even in adulthood. This is directly contrary to earlier teaching.

### PREGNANCY AND LABOR

Reynolds and Kaminster (34) have observed that distention of the rabbit uterus by paraffin pellets causes a growth in the size and weight of the uterus, even after castration. The rate of response of the uterus under these circumstances is as great as that observed in pregnancy. *By the colchicine technique it has been shown that the response takes the form of hyperplasia as well as hypertrophy.* Reynolds (35) found the distention to be promoted by progesterone and inhibited by estrone. During pregnancy the rabbit uterus grows rapidly for the first two trimesters, after which, growth or weight increase practically ceases. At this time, however, the products of conception are still growing at an ever increasing rate. This indicates that the fibers of the uterine muscle must relax like those of the stomach and urinary bladder on being filled. Eventually, however, the limit of functional or "accommodative" relaxation will be reached. At that time the muscle fibers will be excited by a stretch stimulus, to which all smooth muscle responds unless inhibited by some mechanism. It is clear that such "stretching" of the uterus, as of any other hollow viscus, should make conditions ripe for evacuation.

The reviewer cannot resist the temptation to correlate with these findings the evidence concerning the production of estrone, as Reynolds does in his article, and also the new evidence concerning the excretion of progesterone during pregnancy. It has been shown by several workers that the elimination of estrogens in the urine increases progressively during pregnancy (36, 37). Up to within one or two weeks of delivery practically all of the hormone is in the combined form. During the last two weeks the combined form rapidly declines, accompanied by an equivalent increase in the free form, which reaches a peak as labor begins. Immediately after delivery the excretion falls to low levels.

The increase in estrone excretion occurs at the time when uterine growth is inhibited, according to the observations in rabbits. Since estrone increases the motility of the uterus, it will be seen that the motor effect of the hormone reaches its maximum at the time of labor, and would appear to be causally related to it.

Browne, Henry, and Venning (17) have followed the excretion of sodium pregnandiol glycuronide, the inactive excretory form of progesterone, during pregnancy and found that it also is excreted in progressively increasing amounts up to within twenty-four hours of delivery, when it disappears almost completely from the urine. Progesterone is known to exert an inhibitory action upon uterine motility and would seem to be responsible for holding in check the two factors which tend to empty the gravid uterus, namely, the distention and motor effect of estrone. Just before labor, when the inhibitory action of progesterone is withdrawn, the other factors would seem to initiate labor.

It has been observed (13, 37) that during the increasing excretion of estrogens during pregnancy, there is a discernible twenty-eight-day fluctuation in the quantity eliminated. The persistence of this cyclic phenomenon may be responsible for the precipitation of labor at the usual "ten-month" period after conception. Although much work would be necessary to substantiate the above hypothesis concerning the natural termination of pregnancy, it seems at present to be an attractive theory.

The above discussion should not be interpreted to mean that the ovary is necessarily involved in the normal initiation of labor. The uterine growth is not dependent on the ovary, nor is the ovary a significant source of estrogens during the greater portion of pregnancy. The available evidence at present indicates that the factors initiating and controlling normal labor are resident in the uterus itself or in its contents, including the placenta.

### INTERSEXUALITY

Because intersexuality has previously been produced experimentally only among lower forms, our limited knowledge of this type of abnormal development among mammalia has necessarily been drawn from a study of rare and spontaneously occurring forms, mainly the freemartin. Greene and Ivy (38), however, have reported the successful production of varying degrees of "hermaphroditism" among rats by subjection of the pregnant mother to the influence of testosterone at the period of gestation during which the fetuses are undergoing sex differentiation. The male offspring are apparently not significantly affected, but the females show all degrees of intersexuality. Structures which histologically resemble the prostate and seminal vesicles are found. Korenchevsky (39) also observed the development of

the rudimentary female prostate into an apparently normal male prostate under the influence of testosterone. Although evidence of inhibition of muellerian-duct derivatives in the "hermaphroditic" litters is as yet meager, exaggerated development of wolffian-duct derivatives is uniformly present, according to Greene and Ivy.

This experimental production of virilism by the administration of testosterone becomes of interest when it is recalled that androgenic substances have been demonstrated in the urine of pregnant women and in the placenta (40, 41, 42), and that the adrenal cortex elaborates androgen as demonstrated by the maintenance of sex characteristics in castrated male rats by the injection of adrenotropic extracts (43, 44).

Hamilton and Hubert (45) have devised a simple clinical test to differentiate true from false cryptorchidism. In order to induce relaxation in those muscles in which contraction causes retraction of the testes, heat is applied to the genital region of the patient who is comfortably disposed in the supine position with legs apart. Apprehension must be completely relieved by conducting a preliminary mock examination, by complete privacy, and by avoiding any contact capable of eliciting a cremasteric reflex. If under these conditions of relaxation, the testis does not descend either spontaneously or after increase of the abdominal pressure, it is considered to be truly cryptorchid. By this procedure, 10 of 16 cases submitted as cryptorchid, were found to be false. Failure to differentiate between the two types may be partly if not largely responsible for contradictory reports on the effect of therapy in this condition.

### SEX HORMONES ARE NOT SEX-SPECIFIC

Hill (46) has reported that ovaries grafted into the ears of castrated male mice will maintain the seminal vesicles and prostate in a normal condition for as long as one hundred days. This can mean only that the ovaries secrete an androgenic substance. Of course, clinically it is known that arrhenoblastoma is accompanied by virilism.

Numerous investigations have recently shown that testosterone resembles progesterone physiologically as well as chemically. Like progesterone, testosterone suppresses the estrus cycle (Nelson and Merckel, 47; Wolfe and Hamilton, 48; Leonard, Sager, and Hamilton, 49), and the menstrual cycle in monkeys (Hartman, 50), inhibits uterine motility (49), prevents castration atrophy of the uterus with or without progestational changes (49), delays parturition and maintains pregnancy after "early" castration (Sciapiades, 51), and stimulates mammary development (Astwood, Geschicter, and Rausch, 52). It differs from progesterone in that the presence of the ovary, which develops corpora lutea under the influence of testosterone, is necessary for the production of certain of its effects (McKeown and Zuckerman 53). This data together with the facts related in the previous section regarding the presence of androgens in the urine of women shows that the sex hormones are not completely sex-specific either in their effects or in their origin.

Korenchevsky and Hall (54) have carried out an extensive study on the "bisexual" properties of the naturally occurring sex hormones as well as of synthetic derivatives. Korenchevsky (55) cautions against unconsidered clinical use of certain of these compounds because of undesirable effects resulting from their "bisexual" nature.

### THE MAMMARY GLAND

Astwood, Geschickter and Rausch (52) have studied in detail the normal development of the mammary gland in rats from birth to maturity. During the first six weeks after birth the development of the glands is independent of gonadal influences. After sexual maturity the female breast undergoes secretory changes with the estrus cycle, and only during pregnancy develops lobules of acinar tissue. The normal adult male gland is made up of clumps of thick-walled acinar-like structures. Estrone injections produce an extension of the duct tree, and in large doses produce secretory changes with cyst formation in both sexes. Progesterone has no apparent action. Gonadotropic hormone in both sexes hastens the formation of the normal adult gland, and in excessive doses produces cyst formation. Testosterone hastens the development of the normal adult male gland, and in excessive doses produces fibrous changes with cyst formation.

In this connection Jung and Shafton (56) have observed a normal enlargement of the subareolar node of the breast in pubescent boys. This enlargement may occasionally be so extensive as to suggest the presence of a pathological condition, but it is only temporary and deserves no surgical treatment. This growth of the subareolar node is associated with an increase in the testicular diameter and suggests that the increased activity of the testis with elaboration of testosterone is responsible for the breast changes. The above work on the rat supports this interpretation.

The phenomenon of "witches' milk" has for years been suspected to be a result of maternal endocrine influences operating on the breast of

the newborn. Lyons (57) has detected the presence of mammotropin or prolactin in the urine of such infants, in quantities proportional to the activity manifested by the breasts. This secretory activity is very probably the result of stimulation by estrone and mammotropin derived from the mother.

### LACTATION

In discussing the process of lactation one must again bear in mind that important species differences exist. Nevertheless, it is generally accepted that proliferation of the female-gland elements in adulthood and during pregnancy is accomplished by the action of estrone and progesterone. However, the secretory activity of the mammary glands is probably inhibited by these estrogens, the disappearance of which at the time of delivery precedes and permits lactation. The main stimulus to secretion at this time originates in the anterior lobe of the hypophysis as the lactogenic hormone (mammotropin, prolactin). Other less completely understood influences, including nervous reflexes, also play a rôle. (For a recent review of the endocrine control of the mammary gland, see Nelson, 58). Recent evidence shows that other endocrine factors are also involved in the process of lactation.

Nelson (59) has demonstrated the importance of the adrenal cortex. Lactation is disturbed in adrenalectomized animals, but extracts of the adrenal cortex are able to restore the process. In hypophysectomized animals lactation is abolished. In this case substitution therapy requires the lactogenic hormone as well as either cortical extracts or adrenotropic hormone. Nelson and Tobin (60) have now shown that the thyroid gland is not involved in lactation, because the process continues in thyroidectomized animals and because thyroxin with lactogenic hormone is unable to restore secretion in the hypophysectomized animal.

The fact that the estrogenic hormones are necessary, not only to build up the glands morphologically, but also to maintain them in order to permit secretion in response to lactogenic hormone (from the anterior lobe of the hypophysis), has been shown by Grant (61). The regressing mammary gland of the guinea pig fails to respond to prolactin, unless estradiol (dihydrotheelin) and progesterone are also given.

Connon (62) has confirmed previous reports that hormone similar to that of the anterior lobe of the pituitary gland (Antuitrin S) inhibits lactation in albino rats if given in sufficient dosage early enough after delivery. The mechanism of this is obscure; neither estrone nor progesterone seems to be involved as the effect can be obtained in castrated animals (De Jongh, 63).

## HISTAMINE IN THE BLOOD

Within recent years many reports have appeared concerning the presence and significance of histamine in the blood stream under normal and abnormal conditions. Dragstedt and his coworkers (64) in a series of papers have proved that histamine is liberated from the tissues in anaphylactic shock in the dog, and that the vascular reaction and death are completely attributable to the effects of this substance. More recently Dragstedt and Mead (65) have shown that the same phenomenon is responsible for the so-called peptone shock, produced by a first intravenous injection of peptone. The histamine circulating in the blood under these conditions was demonstrated by its depressor effect on the cat, and shown to resemble histamine in all its properties, both chemical and biological.

Barsoum and Gaddum (66) have developed a method for determining histamine in normal blood, the histamine being partially isolated and then assayed biologically. By this method they detected small amounts of histamine in the blood of various animals under normal conditions. All investigators in this field agree that the histamine is contained in the formed elements of the blood so that its activity is slight, but there is no agreement as to which cells are responsible. Some maintain that the greater portion is contained in the red blood cell (67, 69), others maintain that it is present in the blood platelets (68) or in the eosinophils (70). The last finding is of interest in view of the fact that allergic conditions are commonly accompanied by an eosinophilia.

Anrep and Barsoum (71) have reported that restriction of the circulation or increased muscular activity in the dog results in an increase in the histamine concentration of the blood draining the area. Feldberg and collaborators have demonstrated the liberation of histamine from the perfused guinea-pig lung whenever the lung tissues are injured by peptone (72), staphylococcus toxin (73), and snake venom (74). This work would suggest that histamine might be liberated from injured tissues in traumatic shock, but Minard (68) found only a slight increase in blood histamine under these conditions, and the work of Dragstedt and Mead (75) and Schneider (76) demonstrates conclusively that *no significant*

*amounts of histamine are present in the circulating blood during traumatic shock.*

In arsenobenzene allergy produced experimentally in guinea pigs, Simon and Stoub (77) were able to detect increased amounts of histamine in the blood. Reisser (78) also found increased quantities of histamine in tissues during production of the Arthus phenomenon in rabbits. However, in patients with pulmonary tuberculosis and asthma, the blood histamine level was normal, although the sputum, particularly if suppurative, contained significant amounts. Marcou (67) has determined the blood histamine under various conditions and has found greatly increased amounts in myeloid leucemia, and decreased amounts in parturient women.

## VITAMINS

Although it has been known for many years that Vitamin B deficiency and, more recently, Vitamin A deficiency produce histologically detectable lesions in nervous tissue, there has been some disagreement as to the character and location of such changes. Lee and Sure (79) attribute the disagreement to the use of techniques now known to be capricious and productive of artefacts. They have reinvestigated the problem and employ a rapid freezing technique combined with observations with polarized light, methods which are more reliable. In rats subsisting on a diet deficient in Vitamin $B_1$, these authors found myelin degeneration and broken axis cylinders in peripheral nerves. Animals deficient in Vitamin A or B complex showed only the myelin degeneration. The central nervous system was normal except for slight degeneration which was found in the spinal cord.

Epithelial metaplasia is frequently found in pathological material, associated generally with irritation in such regions as the respiratory, biliary, and urinary passages, and also in genital epithelium. Metaplasia may be produced experimentally by Vitamin A deficiency, and by overdosage with estrone, but the interrelation and relative importance of these factors have been little understood. McCullough and Dalldorf (80) have made a recent study of these factors in rats. They used as criteria of genuine metaplasia the appearance of true keratinization, the formation of flat, non-nucleated surface cells, and the presence of keratohyaline granules and intercellular bridges. Their results indicate that Vitamin A deficiency is the primary, essential condition for metaplasia, and that estrone and mechanical irritations act solely as secondary factors. It is interesting that they commonly observed metaplasia in the thyroid in Vitamin A deficiency, but only in association with epithelial hyperplasia. The authors believe that active epithelial growth, whether due to estrone, to mechanical irritation, or to spontaneous hyperplasia, will take the metaplastic form if Vitamin A deficiency is present.

Two studies have recently appeared on the toxicity of vitamin preparations. Perla (81) administered massive doses of brewer's yeast, Vitamin B adsorbate, and synthetic Vitamin B, to rats and found the only resulting abnormality was some interference with lactation and nursing instincts. Concerning the alleged toxicity of cod-liver oil, Burack and Zimmerman (82) report that the slight difference in growth rate of rats fed on diets containing from 18 to 27 per cent cod-liver oil or peanut oil was attributable to the difference in the caloric values of the two diets. Pathological lesions occurred so rarely as to be insignificant. In both studies the vitamin dosages were enormously greater than therapeutic dosages.

Growth of our knowledge of the clinical aspects of the vitamin-deficiency diseases has been hampered because diagnosis has had to depend on the recognition of comparatively severe, and only typical symptoms of deficiency. It would be of immense importance if a deficiency could be detected by an analysis of the vitamin content of the body fluids before clinically recognizable symptoms had developed. Although not completely satisfactory as yet, methods have been devised for estimating by chemical means the Vitamin A (83) and C (84) content of the blood. (For a discussion of these methods, see Eddy and Dalldorf's recent excellent book on the avitaminoses, 84.) Recently two methods have been published for determining the Vitamin B content of the blood. Meiklejohn's method (85) is based on a biological assay of the growth-promoting effect of the vitamins on cultures of phycomyces. Pyke's method (86) is based on the conversion of B to thiochrome, which can then be measured in extremely small amounts by its fluorescence. This procedure is applicable to foodstuffs, tissues, and urine, but has not yet been applied to blood. Warkany (87) determines the Vitamin D content of blood serum by the line test in rats deficient in Vitamin D.

The fact that *the presence of bile in the intestine is essential for the proper* absorption of the fat-soluble Vitamin A (88) and D (89) was demon-

strated several years ago by Greaves and Schmidt. These authors have recently extended the work to include Vitamin E, the anti-sterility vitamin, among those requiring bile for absorption (90). They also observed that their rats with bile fistulas exhibited a loss of blood coagulability accompanied by a decrease in the prothrombin level of the blood, a condition which was relieved by the administration of large doses of Vitamin K, the anti-hemorrhagic vitamin, or by bile salts alone if the diet contained adequate quantities of the vitamin (91). This suggests that this factor also is transported across the intestinal mucosa by bile. The same loss of blood coagulability appeared in rats jaundiced by obstruction of the bile ducts.

The last statement recalls the work of McNealy, Shapiro, and Melnick (92) who were able to control the bleeding tendency, which is easily detected by the Ivy bleeding time, in jaundiced patients by the administration of viosterol. This treatment was based on the fact that Vitamin D is apparently involved in hemostasis, and on the evidence that a deficiency existed in these patients because of inadequate vitamin absorption resulting from a decrease or absence of bile in their intestines. The value of viosterol both in hemostasis and prognosis, and the dependability of the Ivy bleeding time in detecting the hemorrhagic diathesis in jaundice have been completely confirmed recently (93). On the basis of Greaves and Schmidt's work, Vitamin K may also be of value in these cases.

Vitamin K (*Koagulations vitamin*) is a fat-soluble factor, a deficiency of which in chicks produces anemia, and subcutaneous, intramuscular, and abdominal hemorrhages apparently due to reduced blood prothrombin. Similar symptoms have been produced in ducks and geese (94). The above quoted work of Schmidt and Greaves (91) indicates that rats also require the factor. Although its chemical constitution is not known as yet, it has been obtained in a crystalline form by Almquist (95). It has been found in hog-liver fat, leafy vegetables, and to a lesser extent in many cereals. It has been reported that the severe anemia accompanying Vitamin K deficiency in chicks can be cured within three days by minute amounts of the factor (96).

There is rather satisfactory evidence that Vitamin C contributes to the body's defense against infectious diseases. In tuberculosis the effect may possibly occur because of the necessity of the vitamin for the production of intercellular substances in scar formation. Cevitamic acid seems also to protect against diphtheria toxin. (See discussion in Eddy and Dalldorf, 84.) Attempts to demonstrate the effects of Vitamin C on the opsonic index, complement titer, and bactericidal index, have yielded conflicting results. However, Madison and Manwaring (97) have confirmed a previous report (26) that the administration of large doses of cevitamic acid increases antibody production. These authors found that if sodium ascorbate was injected simultaneously with horse serum into rabbits, the precipitin titer of the blood was greatly augmented over that of the controls, and persisted at high levels for a much longer period. This suggests that the vitamin may be involved in specific resistance to disease as well as in "constitutional" resistance.

One must keep the vitamins, as well as the calories and the physiology of the basic foodstuffs, in mind in the treatment of disease, but not become a food faddist or enthusiast. One should bear in mind the possibility of a "subclinical vitamin deficiency" whenever there is (1) a gastrointestinal disturbance, (2) an increase in the basal metabolic rate, and (3) an increase in the growth and reparative processes going on in the body. The vitamins are as essential to build, maintain, and repair protoplasm as minerals and other foods.

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# SURGERY OF THE HEAD AND NECK

## THE VALUE OF IRRADIATION IN TOXIC GOITER

### Collective Review

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KNOWLEDGE of a relationship between the thyroid gland and a characteristic symptomatology with altered bodily metabolism is of long standing, but the exact etiological relationship of the thyroid to toxic goiter is not settled. The cause of the latter condition is unknown, but Boyd suggests that the cause may not originate within the thyroid. The latter writer mentions that the thyroid changes probably are compensatory in nature, a response to a primary metabolic disorder elsewhere in the body. Boyd reduces all of the changed anatomical appearances of the thyroid to terms of diffuse or localized hyperplasia and involution, the former being a compensatory process when the deficiency has been corrected. Both phenomena may be present simultaneously in the thyroid, but a predominance of one over the other influences the clinical picture. Whatever the exact cause of toxic goiter may be, the symptoms are related to overactivity of the thyroid, and it is from this phenomenon that the patient needs to be protected.

It would seem more in keeping with physiological principles to employ a therapeutic agent with inhibitory influence on cellular activity of the thyroid. Thus, radiation for inhibition of the thyroid, or for destruction of portions of it, would appear more ideal than removal of all or most of the gland.

Beck, F. H. Williams, and Pusey were among the earliest to report the use of roentgen rays in the treatment of goiter. This was about 1900. Pfahler also made early contributions. In 1916 Pfahler and Zulich concluded: (1) all cases of hyperthyroidism should be given at least one roentgen treatment, and one month should elapse before operation; (2) treatment should be directed toward the thymus as well as toward the thyroid; (3) an increase in weight and a decrease in pulse are the first signs of improvement; (4) treatments should not be prolonged over too long a period; and (5) the goiter and the exophthalmos are last to show improvement and many times show no change.

In 1923 Holmes (2) stated, "The truth in regard to the best treatment for exophthalmic goiter probably lies somewhere between the views of the enthusiastic surgeon and the enthusiastic radiologist." Two-thirds of all of Holmes's patients with toxic goiter were either cured or benefited. The condition in the remaining third was unchanged. He recommended correlation of roentgen and other forms of therapy.

In 1925 we were able to conclude on the basis of 400 cases observed that 80 per cent of exophthalmic goiters will respond to radiation therapy. The importance of individualizing each case was emphasized, and also the need for metabolic determinations correlated with clinical evaluation of the patient as a control for the management of radiation therapy was brought out.

Pfahler and Vastine (5) in 1930 reported on observations made while treating 400 cases of goiter. Of this number 235 were classified as the exophthalmic variety. Fifty-eight per cent of the patients were cured for an average of six years, a cure being manifest by absence of: toxic symptoms, visible thyroid enlargement, recognizable residual myocardial change, and diminution of the exophthalmos. Twenty-eight per cent of the 235 patients were markedly benefited and able to resume their occupations but with some restriction of activity. The authors found the percentage of cures no higher in the mild than in the more severe cases. They observed that the sooner after onset of the condition treatment was instituted, the better the response. Eight per cent of the patients were operated upon subsequently. Nineteen, or 8 per cent, presented postoperative recurrences. Of these 19, 79 per cent were either cured or markedly benefited. Of the sequelæ encountered, telangiectasis and hypothyroidism of mild degree were considered as probably being due to more radiation than is now employed. Telangiectasis occurred in 4 per cent of the patients, all of which were among the earliest treated. Four patients developed hypothy-

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roidism, but only 2 of these manifested clinical symptoms which required thyroid medication. Nineteen patients died, the death in most instances being due to causes unrelated to the thyroid condition, or due to the markedly advanced state of the toxicosis. In comparing the drop in the metabolic rate obtained surgically in 100 cases at the Lahey Clinic with the drop obtained as a result of irradiation, Pfahler observes that a large factor in the metabolic drop noted in the surgically treated cases may be attributed to the medical measures, particularly rest, which were instituted before surgery was started. The patients treated by irradiation were ambulatory, often pursuing their usual activities.

Pfahler treated 92 patients with toxic adenoma and obtained either cure or marked improvement of the condition in 91 per cent. He found that the enlargement in exophthalmic goiter most often disappeared completely following irradiation, but it usually was the last symptom to disappear. Adenomatous goiter was reduced in size but did not disappear completely.

From the standpoint of technique, Pfahler divided the anterior cervical region into four areas, two anterior and two lateral, each area approximately 5 by 15 cm. in size. The anterior areas extended well down over the upper mediastinum. The upper limit was taken 2 or 3 cm. below the cricoid cartilage and the larynx was protected with lead. The direction of the rays was downward and medially in such a way that cross-firing was produced. In adenoma, localized doses are recommended with cross-firing of the adenoma through two portals. In the milder toxic cases an initial dose, 50 per cent of the skin-erythema dose, was given through each of the four portals. This should be repeated, according to Pfahler, in three weeks, with less irradiation, i.e., with from 40 to 50 per cent of an erythema dose. After this, the interval may be prolonged from four to eight weeks with gradual reduction in the amount of irradiation. The subsequent course is determined by the response to irradiation. Pfahler stated that it is probably wiser to give initial doses of from 30 to 40 per cent of the skin-erythema dose in the more severe cases, and gradually increase to 50 per cent. Pfahler also stated that he expected almost complete relief after six series, and that ten series was the maximum in any case. Three or four series of radiation treatments and a lapse of from two to three months without improvement requires the use of other measures. Pfahler included in his report a summary of 3,300 cases treated by other radiologists with cure or marked improvement in the condition in an average of from 85 to 90 per cent of the cases.

In a later report (4), Pfahler commented that overactive glandular tissue was more sensitive than the normal, and cited the work of Orndorff and Ivy who found that it took about 6 human erythema doses to depress the function of the submaxillary gland in the dog with this dosage, approximately twice the amount of total irradiation given for hyperthyroidism in from six to eight months. He cites further the work of Walter, Anson, and Ivy who stated, "The normal thyroid of the dog is quite resistant to x-rays and degenerative changes are not caused by the dosage used in the experiments, which is a dose known to be of some clinical value," and "in the dosage used do not cause extensive proliferation of connective tissue. . . . The results indicate that the clinical dosage in the treatment of hyperthyroidism will not injure the parathyroids."

In this report, Pfahler's technique was the following: 130 kv. peak, 5 ma., 8 min. at 30 cm. distance, filtered through a combination filter of copper and aluminum equal to 6 mm. of aluminum. This gave 40 per cent of an erythema dose for the equipment used. Two anterior and two posterior fields, each about 5 by 15 cm. to include both the thyroid and the thymus glands, were employed. It was necessary to protect the larynx and the remainder of the body. Pfahler gave the series of four doses in succession in one day, repeating in three weeks and then in four weeks, the interval being increased in accordance with the response. Therapy was discontinued as soon as the basal metabolism reached plus 15 or plus 10.

At this time, Pfahler found on reviewing all of his cases that 87.8 per cent of the patients were either cured or markedly benefited. A cure was based on a normal metabolic rate, normal pulse and weight, absence of all toxic manifestations, and disappearance of the goiter. Improved cases were those in which the metabolism was markedly decreased and most of the toxic phenomena had subsided. The average number of treatments in which a series of 4 fields was given on one day was 6.1 for the cured cases; 5.7 for the improved cases, and 3.7 for the unimproved. The cured patients were kept under observation for an average of 5.2 years and the patients who were benefited for an average of 2.2 years. Pfahler concluded that the results obtained by irradiation were equal to those obtained by surgery with less shock and risk to the patient and without the danger of hypothyroidism and tetany. He stated:

"Not surgery, nor irradiation, nor medication can be depended upon to cure all cases and no one method is so much superior that we can recommend it to the exclusion of the other two. Our records show almost exactly as many cases referred by us to the surgeon as were referred to us after surgery had failed. . . . It is the general opinion of radiologists that all cases which are not seriously involved by mechanical pressure, or so acute as to make delay of one month dangerous, should be treated by irradiation. Irradiation and every valuable method of medication can certainly be employed to advantage. If there is no definite improvement after two or three months, surgery can still be used. The delay which always precedes operation can be used to advantage in this manner. When irradiation fails, surgery can still be used; when surgery fails, irradiation can be used. Medication and the advice of the internist are of value in all cases, but there will remain a small number in which we all will fail."

This year, Harris (1) reported the results of seven and a half years' observation of cases of toxic goiter irradiated at the University of Pennsylvania. During the first part of the period, the technique consisted of 135 kv. peak, 5 mm. aluminum filtration, 4 min., through 4 by 4 inch portals to four different areas over the gland. Approximately 125 roentgens were given in this manner and a series was given at three-week intervals. Later during the period under consideration the dosage was increased to 250 roentgens, which were given to the gland through one large portal with 135 kv. peak (mechanical rectification), 5 ma., and 30 cm. distance. The output with these factors was 27 roentgens per min.; half value layer .42 mm. copper, and effective wave length, .23A°. They employed a 12 by 15 cm. portal which included the anterior thyroid area and the cervical sympathetics with protection to the larynx. An alternate technique employing higher voltage when low voltage had been ineffective was used occasionally. This technique used 165 kv. peak (valve tube rectification), 15 ma., .5 copper plus 1 aluminum filtration, and 50 cm. distance. These factors produced an output of 40.0 roentgens per min., half value layer, .88 mm. copper, and effective wave length, .17A°. Two hundred roentgens, measured in air, were given every other day for three days, and 600 roentgens constituted a series. A basal metabolism rate was taken in one month and further therapy depended on the results obtained. The importance of accurate calibration in roentgens was emphasized.

This analysis, based on 244 cases of toxic goiter, led Harris to state that improvement became more apparent with the progress of time. Thus, the good results in the first part of the period constituted only 50 per cent of the cases treated while in the last part of the period good results were obtained in 90 per cent of the cases. It was not possible to reach a conclusion on the relationship of the results obtained to the number of series of treatments given. Usually two series of radium treatment and ten series of roentgen treatment were given. The radium was used in the form of a large pack to each half of the gland as a series, with 4 mm. lead filtration and 3 cm. distance. There was no significant relationship between the patient's age and the response. Harris favors treating the following types of cases: (1) postoperative recurrences; (2) those with mild to moderate degrees of hyperthyroidism in which the predominating symptom is nervousness and in which there are no evidences of visceral damage, those associated with little or no loss in weight, and those with slight to moderate thyroid enlargement and in which the goiter is not hard or nodular; (3) those of children with toxic symptoms are treated, except those with nodular goiters; (4) those of patients who are poor operative risks and to whom the irradiation is given as a pre-operative procedure; and (5) those in which the patients refuse surgery.

Prior to 1930 it was not uncommon for us to treat 3 or 4 patients daily for thyroid toxicosis by means of irradiation in the x-ray department of St. Luke's Hospital. Since 1930 there has been a marked decrease in the number of patients referred to the department for treatment. This decrease in the number of patients treated may be due to several factors. First, the use of iodine for the preparation of the patient probably made the patient a better surgical risk. Consequently, more patients were operated upon. We were under the impression that surgeons in smaller cities who formerly referred their patients to clinics in larger cities now, because of the use of iodine and the fact that many were well-trained men, were doing their own surgery. If this were true, we would consequently see fewer patients in our department.

In going over the surgical schedules of many hospitals, including our own, and inquiring of several large clinics, we found that the number of thyroid glands being operated upon had not increased. On the other hand, there had been a decrease.

At a symposium on thyroid disease in which Plummer of The Mayo Clinic took part, he made this statement:

"Following the 1918 epidemic, there was a marked increase in thyroid toxicosis. The increase continued until about 1927 and then rapidly decreased." Plummer said that this probably explained the decrease in the number of the patients coming to the Roentgen Department for treatment.

Since our previous report, we have treated 154 patients with toxic goiter, 70.1 per cent of whom showed improvement clinically and in their metabolic rate. The remainder were unchanged. It is the author's practice to use 125 kv. peak, 5 ma., 10 min., 16 inch distance, and 6 mm. aluminum filtration (effective wave length .25A°), administering 200 roentgens per each treatment on three successive days and thus completing one series. Three portals are used, the anterior to include the thymus area, and right and left lateral areas. In cases that prove refractory, it has been found useful to vary the technique by increasing the voltage to 200 with .5 mm. copper and 1 mm. aluminum. The effective wave length with these factors is .15A°. As mentioned, the necessity of individualizing each case is important, and clinical evaluation of the patient with frequent observations of the metabolic rate is essential.

We prefer to maintain contact with our patients following treatment, whenever possible, in order to evaluate the efficacy of our treatment. Thus, we have records of patients in good health for over twenty years following the initial treatment, and there are also available records of over 300 patients in good health for over four years following their first treatment.

On the basis of our experience, we feel that children should not be treated and that goiters which produce mechanical destructive effects on neighboring structures and those with probable cystic changes should not be irradiated. Male patients and elderly patients with increased metabolism do not respond well to radiation, the latter probably because the increased metabolism may arise on a cardiovascular basis. Hospitalization preceding, during, and for a few days after the initial series, is a desirable procedure, although it is not imperative. Lugol's solution should be discontinued two weeks preceding irradiation because it confuses the results of irradiation. We find that 220 r is an adequate dosage to any one area in any one series. The value of altering the technique arises from the fact that there may be only an isolated portion of the thyroid gland which requires suppression of its activity. This portion may be uninfluenced by radiation with one technique, but influenced with another; that is, there is adequate absorption in the latter case, but inadequate in the former.

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## EYE

**Lagrange, H.: The Surgical Treatment of Chronic Glaucomatous Ocular Hypertension.** *Brit. J. Ophth.*, 1937, 21: 477.

Persons who present ocular hypertension following iritis, traumatism, or tumor may have hard eyes and increased intra-ocular tension, without necessarily being glaucomatous. Ocular hypertension is an essential diagnostic sign in glaucoma, but one that is not exclusively peculiar to glaucoma. The characteristic condition in glaucoma is not hypertension in itself, but the manner in which hypertension occurs. It assumes a particular type in each of the several forms of glaucoma; viz., prodromal glaucoma, chronic glaucoma with intermittent hypertension, chronic glaucoma with constant hypertension, irritative glaucoma, and acute glaucoma.

In prodromal glaucoma hypertension is of low degree. Subjectively, it is indicated by the appearance of a foggy or smoky veiling, or by colored arcs. Objectively, it presents pupillary dilatation and a slight milky turbidity in the cornea.

Chronic glaucoma with intermittent hypertension is defined as optic atrophy with excavation. Hypertension is transitory. Other signs, such as alterations in the visual field, in light sensation, in the papilla, and in the amplitude of accommodation, are often those which permit diagnosis.

Chronic glaucoma with constant hypertension is the clinical type which occurs most frequently. In this type with moderate hypertension, violent crises may follow emotional conditions or surgical procedures. This instability is shown inversely by the remarkable efficacy of rest and also by the use of miotics.

In irritative glaucoma the ocular tension undergoes fluctuations which occur still more frequently. It is always evidenced by pupillary dilatation, changes in the corneal transparency, vascular congestion, and a bluish aspect in the episcleral circulation.

Acute glaucoma presents hypertension and, from the onset, the hardness of absolute glaucoma. It is related to Quincke's disease or to urticaria.

Alterations in the visual field in cases of glaucoma consist in nasal and inferior narrowing. This sign is notorious and requires stressing only in order to recall the fact that its constant and early appearance renders it characteristic of true glaucoma. The most common form, the paracentral scotoma of Bjerrum, is typical. The Mariotte spot may become enlarged. Minor signs of glaucoma consist of the Bjerrum paracentral scotoma, loss of the differential

light sense, and preservation of the absolute light sense. Medical treatment is sometimes capable of retarding its course, of relieving certain prodromal signs of glaucoma, and of rendering grave intermittent exacerbations less frequent. It includes good correction of ametropia, attention to algetic states in the vicinity, study of the oculo-ocular reflexes, regulation of sympathetic imbalance, treatment with calcium chloride or iodides, cardiovascular tonics, correction of hyperglycemia, and anti-syphilitic medication. Pilocarpine is the sole medicinal agent the efficacy and mechanism of which are truly comparable to those of surgical fistulization.

The author asks how is it possible for surgery to be imprudent and inadvisable if the following conditions exist in spite of medical treatment: (1) decline in central visual acuity, (2) failure of the ocular tension to become normal, and (3) progressing alteration in the visual field, such as fluctuations in tension, narrowing of the visual field, and declining visual acuity?

Surgical treatment, though reaching only the hypertensive syndrome, is a measure of prudence and the only palliative one of permanent and durable efficacy, for the idea that hypertension in the eyeball presides over all the ocular signs of glaucoma still remains good.

The author states that the value of iridectomy in the treatment of acute glaucoma is unquestionable, but that it is very disappointing in chronic glaucoma. The solution of the problem of durable fistulization of the eye, and establishment of the principle of action and the site of election were the innovations provided by the Lagrange operation. The following points distinguish this operation from the von Graefe operation.

1. Iridectomy is a classical procedure in acute glaucoma.
2. It is not indispensable in some forms of chronic glaucoma.
3. Iridectomy may be performed by simultaneous section of the scleral crescent between the same jaws of the forceps.
4. In iridectomy care should be taken to grasp the iris without groping for it in the anterior chamber.
5. If iridectomy is not done, the only thing risked is a well protected subconjunctival strangulation of the iris, or iridencleisis.

The beneficial effects of the von Graefe iridectomy are never absent in all treatment for combating glaucoma. The von Graefe iridectomy does not appear to be absolutely necessary in chronic glaucoma.

In conclusion the author states that it is necessary to operate without delay in cases of glaucoma in which medical treatment fails to reduce the ocular tension to normal limits, and that operation is necessary even if the medical treatment does reduce the tension to normal, should alteration of the visual field progress in the slightest degree, or should visual acuity decline. LESLIE L. MCCOY, M.D.

**Spaeth, E. B.: The Use of Mucous Membrane in Ophthalmic Surgery.** *Am. J. Ophth.*, 1937, 20: 897.

Mucous membrane grafts, which should always be taken from the buccal mucosa of the mouth, have a very definite place in ophthalmic surgery. The indication for their use is a conjunctival defect in the presence of an intact and healthy eyeball. The conjunctiva of the eyeball and of the upper lid should never be replaced with skin, as the superficial layers of the skin pile up on the surface of the graft and produce conjunctivitis and keratitis.

In the technique of mucous membrane grafts the intact conjunctiva is first incised and undermined, the cicatricial tissue then being resected. The defect produced is then matched with a model cut from oiled silk. Allowing but little for shrinkage of the graft, the surgeon places the pattern on the buccal mucosa, avoiding the duct from the parotid gland, and accurately cuts the graft. The incision line is sutured with fine dermal suture after hemostasis. The posterior surface of the graft is carefully trimmed down to the mucous membrane layer and then inserted into position in accordance with the particular case involved. In the correction of defects of the inferior cul-de-sac, sutures are not necessary except for a temporary intermarginal suture to keep the lids closed, but a pressure bandage should be employed.

The author believes that mucous membrane has its greatest advantage in the correction of trichiasis and entropion, especially when caused by trachoma. In this condition he uses a slight modification of Van Milligen's original method. Re-formation of the upper lid may be carried out according to the technique of Axenfeld. Lesser defects of the lids may be corrected by use of a pedicle flap with the prior formation of a pocket lined with mucous membrane in such a position that it can later be used to fill in the defect. Mucous membrane grafting is also recommended for pemphigus of the conjunctiva, especially in early cases and in cases of complete destruction of both the upper and lower cul-de-sac from acids or caustics. WILLIAM A. MANN, JR., M.D.

## NOSE AND SINUSES

**Looper, E. A.: Infection of the Nasal Accessory Sinuses in Children.** *Med. Clin. North Am.*, 1937, 21: 1323.

Frequent colds associated with nasal discharge generally mean infection of some of the accessory sinuses. Such infections retard the development of the sinuses themselves so that a condition is left for the continuance of a chronic disease which might have been prevented if early treatment had been instituted. In all cases of children with inflammatory lesions around the nose and throat, in which there is a great deal of sneezing, congestion of the turbinates, and constant colds with thick profuse nasal discharge, a careful investigation of the sinuses is recommended.

The maxillary antra and ethmoid cells are present at birth, while the frontal and sphenoid sinuses make their appearance before the third year. Therefore, from an anatomical standpoint, the sinuses in early life are sufficiently developed to be taken into consideration in pathological processes.

X-ray examination is of the greatest aid in the diagnosis of infected sinuses, but the plate must be made by a skillful roentgenologist and the interpretation must be correlated with the clinical findings.

Orbital abscess is one of the most frequent complications, and often the most dangerous complication of accessory sinus disease. Meningitis and brain abscess are very serious and usually result fatally. Anemia, loss of weight, unexplained low temperature, and gastro-intestinal symptoms are frequently present, so that any such group of symptoms calls for investigation and treatment of the sinuses.

The proper treatment of infected sinuses of children improves their general health; they take on weight, develop more rapidly, and give every appearance of being greatly benefited. Most of the patients can be cured by local treatment, for only a small number require operative procedures. If the tonsils and adenoids have not been removed it is advisable to get them out in order to clear up as many foci of infection as possible. CHARLES BARON, M.D.

## MOUTH

**Ritchie, W. P.: Cleft Palate: A Correlation of Anatomical and Functional Results Following Operation.** *Arch. Surg.*, 1937, 35: 548.

The author reviews the literature and gives a complete summation of all reports of correlated palate repair and speech result. A detailed method of speech study is presented.

The cases of 100 patients who had previously been operated upon for cleft palate, some of whom also had harelip, were carefully studied, both as to anatomy of the corrected palate and as to the correlation of the anatomical result with speech. The findings were as follows:

Good anatomical results do not necessarily mean good functional results.

Imperfect closure of the velopharyngeal sphincter is by far the most important anatomical element in ultimate speech results.

Velopharyngeal insufficiency is the most important factor in the omission, substitution, and disarticulation of most of the consonants. The slurring of *s* and *ch* is an exception.

Velopharyngeal insufficiency is the cause of nasalization and, therefore, the disturbed quality of cleft palate speech. There is a possibility that scar tissue and taut mucous membrane play a rôle in the poor quality of speech by disturbing the vibratory capacity of the cavities of the upper respiratory passage.

Abnormal contour of the teeth causes slurring of *s* and *ch*.

Holes just posterior to the alveolar process in the anterior part of the hard palate have a tendency to cause omission of the labiodental consonants.

Small holes in the hard palate cause no phonetic defect.

Large holes in the middle portion of the hard palate tend to cause a "hot food" quality of speech rather than a disturbance of articulation.

Holes in the lateral part of the hard palate also tend to cause a "hot food" quality of speech.

Holes in the soft palate tend to cause omission of the posterior linguopalatal consonants.

The motility of a palate appears to be more important than length, as regards closure of the velopharyngeal sphincter.

The superior constrictor muscle elements are important in closure of the velopharyngeal sphincter and are usually hypertrophied.

The uvula may be of importance in closure of the velopharyngeal sphincter, but the analysis does not indicate this.

A person with a cleft palate usually has distorted nasal cavities and, occasionally, the inferior turbinate bones are enormously dilated.

Adenoidectomy and tonsillectomy are indicated if the motility and length of a palate are good.

Speech education is of the greatest value in correcting articulation.

No amount of education will entirely overcome marked velopharyngeal insufficiency, although it is of definite value in lesser degrees of insufficiency.

LOUIS T. BYARS, M.D.

## NECK

**Wijnbladh, H.: Thyrotoxic Crises and Their Treatment, With Special Consideration of Iodine Therapy** (Ueber die thyreotoxischen Krisen und ihre Behandlung, mit besonderer Beruecksichtigung der Jodbehandlung). *Acta chirurg. Scand.*, 1937, 79: 507.

The disease picture of thyrotoxicosis may vary so considerably that the symptoms are sometimes defined with difficulty or are even paradoxical, as thyroid enlargement may be absent, with a normal pulse frequency, or a normal basal metabolism. The motor system may vary from complete muscular incoördination up to difficult motion due to apathic toxicosis and catalepsy and parkinsonism. The gastrointestinal symptoms may be diarrhea or constipation. The clinical course shows all transitions from the slightest to the most severe forms, from "galloping" to chronic forms which gradually disappear. During the course of thyrotoxicosis first one, then the other organic system may be involved. "Basedow coma" is one of the severest complications. The term "crisis" refers to conditions which directly threaten life.

The different types of operations on the thyroid are the most frequent causes of the crisis. These may produce the "typical Basedow death" or postoperative reaction. Similar crises may also result

from operations on distant organs and even minor surgical interventions, roentgen therapy, massive thyroid medication, and sudden interruption of a pre-operative iodine therapy, infections, diagnostic procedures such as the determination of the basal metabolism, bodily exertion, and severe emotional strains. A severe thyrotoxicosis may also lead spontaneously to a crisis.

Since the introduction of pre-operative iodine therapy the danger of postoperative crises is rare. The true non-postoperative crises are rare in Oslo because these cases are treated by surgeons promptly and adequately. They are more common and more severe in males than in females.

The symptoms of the fatal postoperative crisis are characteristic and too well known to require description. Those of the other, the non-postoperative form, vary similarly as the different clinical forms of thyrotoxicosis. A threatening sign is every aggravation of the patient's condition, especially insomnia, anorexia, and vomiting. Aggravation of existing symptoms is characteristic. The symptoms of one and then the other organic systems predominate, such as the gastro-intestinal and cerebral systems. The course may be fatal after one or a few days, or the symptoms may recede after the exciting factor, such as infection, subsides or etiological therapy is instituted. Five such cases are reported.

Both the postoperative and the other crises are best prevented by the modern pre-operative iodine therapy. Most of the fatalities from non-postoperative crises may be avoided by early surgical treatment of the thyrotoxicosis. These patients should be treated in suitable hospitals, as they are extremely influenced by their surroundings. A sudden removal from their surroundings to a surgical division is a considerable trauma. The patient's confidence should be gained by the surgeon. Basal-metabolism tests should not be made when the symptoms become aggravated. The taking of the skin temperature (Ipsen) is a valuable substitute. Slight interventions, such as mouth sanitation, should be done only after serious consideration of their possible effect. If an acute, urgent operation, such as appendectomy is necessary, the thyrotoxicosis should be treated simultaneously. The author believes that "non-surgical" iodine therapy, especially with large doses and in severe cases, is dangerous in the ultimate surgical treatment. This should serve as a warning that iodine therapy in all thyrotoxicoses in which surgery is contemplated should be done only with consent of the surgeon or entirely under his control. In thyrotoxicoses, iodine should be given only pre-operatively or in cases in which surgery is not likely to be employed. The iodine therapy of Plummer, on the other hand, is one of the best positive remedies for preventing crises.

The treatment of imminent or beginning crises includes strengthening of the usual measures against thyrotoxicosis; also isolation against all external disturbances; a diet rich in calories and especially Vitamins A and C; abundant sedatives and narcotics, such as 0.9 gm. of luminal per day or dial as a substitute, and morphine and the like, and in very rebellious cases eukodal scopolamine, also given pre-operatively. The abundant administration of fluid and glucose by mouth, rectum, and by injection is most important. Sodium chloride may be added to the glucose solution. The glucose solution should be given in large doses, of 500 gm. or more in 5 liters daily by continuous intravenous drop infusion. Cardiac and vascular remedies, such as digitalis, strophanthin, quinidine, and camphor preparations, have a limited value during a crisis and should be reserved for special cases, such as severe cardiothyroses. Bloodletting followed by blood transfusions are helpful. Ice packs and oxygen-tent therapy are advantageous. Kendall's adrenal cortex extract, as well as sodium citrate and physiological salt solution have been employed at the Mayo clinic.

The pre-operative iodine therapy is one of the most certain protective remedies against both the pre-operative and postoperative crises. The usual dosage is from 30 to 60 mg., or from 5 to 10 drops of Lugol's solution, two or three times daily, usually increased gradually to from 90 to 125 mg., or from 15 to 20 drops of Lugol's solution three times daily for from eight to twenty-one days. A double or even greater dosage on the day of operation and thereafter has a certain value. The dosage should be individualized. When the pulse and temperature rise, when the struma increases in vascularity, and when the patient looks and feels worse, the iodine is increased. Iodine is most necessary in imminent or existing crises, especially postoperatively. Iodine should be given in very large doses and increased if necessary until the patient's reaction improves. Then the dosage is decreased.

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**Giuffrida, E.: Laryngeal Stenosis in Undulant Fever** (Stenosi laringee da brucellosi melitense). *Minerva med.*, 1937, 28: 99.

Giuffrida believes that the 3 cases here presented are, together with Gritti's case reported in 1934, the only reports of laryngeal stenosis occurring during the course of a previously diagnosed undulant fever. Two cases of necrotic pharyngitis with bronchopneumonia were reported by Frugoni in 1930, and by Malan in 1931.

After five months of fever, the first patient, a man forty-two years old, developed a perichondritis involving the epiglottis and arytenoids with extensive ulceration and necrosis. Cultures showed a mixed flora. Death occurred from sepsis.

The second patient, a youth of twenty years, had apparently recovered from a severe attack of undulant fever, but a month later a hyperplastic perichondritis involving particularly the arytenoids occurred. Tracheotomy saved the patient's life, but a cicatricial stenosis developed, and the latter is still under treatment.

In the third case also, the fever had been absent for five months, when it reappeared, accompanied by laryngeal edema. Examination showed ankylosis of the left crico-arytenoid articulation and fixation of the cord, which produced noteworthy stenosis. Death was due to lung abscess.

In the fatal cases intravenous vaccine therapy had never been carried out consistently, and in the surviving case it was begun late. Early and adequate intravenous administration of vaccine is, in the author's opinion, the best prophylaxis against laryngeal complications. Furthermore, the possibility of an undiagnosed brucella infection must be considered in laryngeal stenosis of uncertain cause.

The pathology of laryngeal stenosis in undulant fever is fundamentally the same as in other infectious diseases. The lesions may involve the mucosa or skeleton, or both, and may be complicated by ulceration, necrosis, and eventually sepsis; or hyperplasia of the mucosa may result in cicatricial stenosis. A difficult question to answer is whether the laryngeal lesion represents an independent localization of the brucella or is due to secondary organisms. None of these patients had had laryngeal symptoms previous to the undulant fever, but during its course they presented certain suggestive manifestations. In the first patient, the infection began with sore throat and high fever. Several months before the laryngeal symptoms appeared, the two other patients had aphthous stomatitis and pharyngitis, which yielded to treatment. These facts are probably significant in view of the rarity of involvement of the upper respiratory and alimentary tracts in undulant fever.

The occurrence of laryngeal stenosis must be regarded as an indication of particular gravity of the disease, entirely separate from the local lesion, and it always carries a dubious prognosis. Even though tracheotomy may overcome the immediate danger, its ultimate success is usually frustrated by other factors. M. E. Morse, M.D.

**Martin, C. L.: Malignant Tumors of the Throat.** *Surgery*, 1937, 2: 381.

The author reports 17 cases of malignant tumor of the throat, and presents evidence to show that irradiation therapy is the method of choice in all malignant tumors of the pharynx and larynx. He employs a modified Coutard's technique. A complete regression of the primary tumor was obtained in all of the 17 cases of pharyngeal carcinoma, and marked improvement appeared in the neighboring extensions, even in advanced stages of the disease. Death, when it occurred, resulted from complications or distant metastases. The immediate improvement in the patient's condition was very striking in every instance. The author's experience had not at this time extended over a period of five years. He concludes that irradiation should replace surgery in all borderline and inoperable cases. Joseph K. Narat, M.D.

# SURGERY OF THE NERVOUS SYSTEM

## TRIGEMINAL NEURALGIA

### Collective Review

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A REVIEW of the recent developments in our knowledge of trigeminal neuralgia would not be complete without some mention of those individuals who first directed the attention of the medical world to the condition and who have made major contributions to our understanding of it. The names of Avicenna, Schlichting, André, Fothergill, Carochan, Rose, Horsley, Hartley, Krause, Pitres and Verger, Levy and Baudouin, Spiller, Frazer, Patrick, and Cushing stand as guideposts along the trail that medicine has followed in its search for complete understanding of the condition. The fact that this goal has not yet been reached is adequately shown by the large number of articles on various phases of the subject which have appeared in medical publications in the past six or seven years.

For the purposes of this review, a rather complete bibliography of all publications on the subject from 1930 through the first half of 1937 has been assembled and is appended for the convenience of those desiring more detailed information than a compendium of this nature permits. Many of these articles have thorough historical reviews in their introductions (5, 52, 66, 130, 156, 206, 223, 339). The reader is referred through them to the more ancient sources.

Because most of the articles are not limited to a discussion of any one phase of trigeminal neuralgia, it is a practical impossibility to segregate the various works into appropriate divisions so far as the etiology, pathology, diagnosis, differential diagnosis, and treatment of the condition are concerned. However, the author will, for the sake of clarity in the review, consider the works on trigeminal neuralgia under those headings, with, it is hoped, sufficient reference to the bibliography to guide one desiring to make a more complete study of the subject. It is obvious, also, that space does not permit detailed mention of every publication on the subject in a review of this nature. It has been the aim to bring out the more important developments in so far as possible in such a way that the majority may have, in brief, a thorough insight into the progress made in this one field in the past few years.

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#### ETIOLOGY AND PATHOGENESIS

Careful perusal of the literature serves only to emphasize the fact that the exact nature of trigeminal neuralgia continues to elude us. Many hypotheses have been promulgated, frequently with good evidence to support them. As yet no absolute proofs are at hand. Numerous theories are quite contradictory.

Many isolated cases are reported as being due to specific conditions such as: dental granulomas (97), sensitive fillings (247), infected tonsils (276), tumors of the pituitary gland (39), chronic sinusitis (95, 228), diabetes (16, 250), syphilis (93), and faulty calcium metabolism (215). It may here be stated that some authors (10, 15, 54) are careful to distinguish between "typical" or "true" trigeminal neuralgia and other types of facial pain which may closely simulate it. Strict adherence to the concepts of some as to what constitutes "true" trigeminal neuralgia would seem to vitiate some of the aforementioned causes. However, the descriptions of the condition given in most of the cases are truly typical.

While it is infrequently seen before the age of thirty years, some cases are reported as occurring as early as the age of ten or twelve years (60, 200, 248, 325). Heredity or familial tendency is mentioned as a possible factor (35, 326). Harris (326) stated that in his experience inheritance as a factor is not very rare and when it is a factor the condition invariably appears at an earlier age in the second generation and at a still earlier age in the third. The incidence of trigeminal neuralgia in women has been considered to be much higher than in the opposite sex (Caldwell 200). Jefferson (62) does not think the sexual disparity marked enough to lead in itself to any special deductions.

The appearance of trigeminal neuralgia in cases of multiple sclerosis has been noted by many observers (131, 180, 282, 326). Meredith and Horrax (282) found 25 cases of concomitant tri-

geminal neuralgia and multiple sclerosis in a seventeen-year review of the literature and added 2 cases of their own. With a careful analysis of these cases they were unable to account for the origin of the facial pain in multiple sclerosis. They called attention to the fact that while paresthesias and numbness are common in multiple sclerosis, pain or neuralgia of any type is rare. They believed it unlikely that plaques in the root or medullary course of the trigeminus could account for the origin of the pain in cases of multiple sclerosis.

Dandy (203), in a search for possible causes of trigeminal neuralgia, noted that in 10.7 per cent of the cases there was a definite relation of a gross lesion to the production of pain. If he included arterial and congenital anomalies about the root and cases of multiple sclerosis, the percentage was raised to 42 per cent. Aberrant venous branches raised the total to 56 per cent, and if he included cases showing adherent nerve roots the percentage was raised to 60 per cent, which leaves only 40 per cent without evidence of gross lesion to account for the pain production. For this latter group he considered the possibility of some intrinsic disturbance of the sensory root, as he believes that whatever the cause of trigeminal neuralgia it must be located in the sensory root.

Alajouanine and Thurel (139) subscribe to a theory embracing a more central origin of the pain. The fact that the trigger zone and the painful area are sometimes dissociated, the fact that the pattern of irradiation of the pain does not always correspond to the course of the nerve trunks, and the fact that there is a variability of action of the provocative cause from one moment to another, they argue, point to a nuclear cause for the syndrome. The authors mentioned the cases of trigeminal neuralgia in multiple sclerosis and syringobulbia as examples. They were able to account for the relief of the pain by neurotomy or alcohol injection only if it was admitted that the pain depended upon a dolorogenic zone. However, they state it is not understandable how a pain of nuclear origin can disappear after the peripheral destruction of the nerve.

A number of observers would locate the site of origin of trigeminal neuralgia in the gasserian ganglion. McKechnie (170) thought his case demonstrated that the neuralgia may be caused by some abnormal vasomotor influence in the ganglion. Grant (265) reported comparative studies of ganglia and nerve trunks from 2 patients with trigeminal neuralgia dying from apoplexy. No difference between the nerves and ganglia from the affected and the non-affected side could be discovered on most searching examination.

Harris (326) believes that the evidence points to a more peripheral origin for the condition. It is his view that trigeminal neuralgia is most probably due to some pathological changes in or about the nerve endings.

The functional nervous elements present in many cases of trigeminal neuralgia are considered at length by Ball (1). In his opinion trigeminal neuralgia belongs in the category of functional nervous conditions. He expresses the belief that the condition presupposes a neuropathic disposition and that in these cases the distribution of the fifth nerve is the conditioned place for the painful sensation. Kulenkampff (15), also, discloses a unitarian conception in which he attempts to show that trigeminal neuralgia is not a condition for which the trigeminal nerve need be held responsible but a state of far more general origin. He bases his hypothesis upon the belief that sensitivity to pain is transmitted through the sympathetic system, thus permitting the theory of a possible psychically central conditioning of the trigeminal area. Tyler (296), among others, also blames sympathetic overactivity for the occurrence of the attacks, although apparently on a more definite organic basis.

### DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

Whatever the causative factors and the pathology in trigeminal neuralgia, most authors are agreed that the diagnosis must be made directly.

Thus the diagnosis of trigeminal neuralgia still depends upon the subjective complaints of those suffering from it. We are quite safe in saying that little has been added to earlier descriptions of the condition in the years under review. Probably the greatest development in the improvement of diagnosis and differential diagnosis of the syndrome has been the clarification of ideas regarding various other types of face pain. The necessity of differentiating between "true" major trigeminal neuralgia and "atypical" facial pains is emphasized by many writers (10, 54, 158, 222, 358). As Ney (66) stated, "It is these cases of so-called 'atypical' facial neuralgia which remain a stumbling block in trigeminal surgery and are to be most carefully differentiated from the 'true' or 'typical' types of the disease."

Glaser (10) considered the salient diagnostic features of the facial neuralgias. He divided them as follows: trigeminal neuralgia, tumors of the gasserian ganglion, atypical neuralgias, sphenopalatine neuralgia, neuralgia of the seventh cranial nerve, neuralgia of the eighth cranial nerve, neu-

ralgia of the ninth cranial nerve, neuralgia of the tenth cranial nerve, neuralgia due to malignant invasion of the various cranial nerves, and dental pulp stone neuralgia.

Frazier (54), in discussing the diagnostic problems in trigeminal neuralgia, noted that the diagnosis is usually possible directly from the symptoms and laid special stress upon the typical nature of the pain. In his opinion those cases with definite atypical manifestations are not true trigeminal neuralgia. He also called attention to some favorite diagnostic criteria: the patients usually have a high tolerance to morphine, and morphine has scant effect upon the pain. These patients rarely, if ever, develop the narcotic habit. The pain of true trigeminal neuralgia usually does not interfere with the patient's sleep. The pain always adheres to the distribution of the fifth nerve on the side affected.

Grant (265) pointed out the necessary factors for a diagnosis of true neuralgia of the trigeminal nerve, which depend entirely upon a description of the character and distribution of the pain. The severity of the pain is such that pains of other varieties or in other parts of the body seldom compare with it. It is paroxysmal, with occasional periods of complete remission, and is referred to the skin segments of the area supplied by the trigeminal nerve, radiating in a direction parallel to the main branches of the nerve. Grant also called attention to the other characteristics of the condition, including the presence of the "trigger," or "dolorogenic zone."

Horrax and Poppen (270, 271), among others, advocate local anesthesia or alcohol injection as a diagnostic test in all cases of trigeminal neuralgia. Those cases that do not obtain relief following successful anesthetization by injection they would consider as atypical or as not true trigeminal neuralgia, and as such not suitable for operation. They are of the opinion that in addition to being a diagnostic test of merit, the preliminary injection serves to adjust the patient to the anesthetic zone resultant from root section.

Grant (323) similarly advocated alcohol injection in certain cases as a diagnostic method. In the discussion of Grant's article, Dandy states that he does not believe it necessary to use such diagnostic procedures in most instances; while Jaeger expresses the opinion that failure of relief from injection of one branch of the nerve is not necessarily proof of the absence of trigeminal neuralgia.

### TREATMENT

No one will deny the fact that, to date, the achievements in the treatment of trigeminal neuralgia have been greater than any gains in our knowledge of the causes of the disease. Thus, "while in many diseases, therapeutic empiricism is fraught with danger, in this instance, therapy has far outstripped our knowledge of the fundamental facts" (Davis, 206). Also, it may be logically stated that, so long as such a condition holds, there will be some dissatisfaction with the modes of treatment commonly employed, and repeated efforts will be made to devise new and more satisfactory methods as well as to improve the technique of the old.

Most of the authors reporting specific conditions causing trigeminal neuralgia, as previously noted (97, 247, 276, 39, 95, 228, 16, 250, 93, 215), come to their conclusions because the painful attacks were seemingly relieved by treatment directed toward the cure of such conditions. Wholly aside from the question of etiology, these instances serve to emphasize the advisability of treating any local or generalized specific pathological processes found to be present in patients having trigeminal neuralgia.

While surgical methods occupy the attention of the greater number of writers on the subject in the period under review, a few report some success with varied types of medical therapy. The general failure of analgesics and even opiates to afford any marked measure of relief in trigeminal neuralgia is again noted (54, 206, 265).

While the use of trichlorethylene in the treatment of trigeminal neuralgia dates back to a time previous to the years covered in this article, a careful analysis of the benefits to be expected from its use has been given by Glaser (55). He found that about 15 per cent of the reported cases treated with this drug up to that time had been completely relieved of symptoms. The percentage of cases receiving partial relief varied with different investigators, from 13.3 per cent in his cases to as high as 74 per cent in the series of some others.

Inskeep (215) reported relief in a number of cases from the simple administration of one heaping teaspoonful of calcium gluconate in a glass of water thirty minutes before breakfast each morning. The subsidence of symptoms was gradual and took from seven to fourteen days to be complete. In some cases the ingestion of a small amount of calcium must be kept up indefinitely. In some cases with relapses after alcoholic debauches or severe respiratory infections, the pain could be relieved as in the initial attack, by more calcium.

Ramond (342) obtained relief in one case by the use of ergotamine tartrate, together with a reg-

imen directed toward general protein desensitization. Tyler (296) reports a case in which there was marked relief for one year after 8 weekly injections of ergotamine tartrate.

Solito (124) reported on 3 patients, entirely free of lues, with essential neuralgia of the trigeminal nerve, who were relieved by gradually increasing dosages of arsphenamine administered intravenously. He based his treatment upon the previously reported work of Furno, to whom he refers as having treated 19 cases by this means together with quinine dihydrochloride by mouth. Because 2 of his patients received no quinine, Solito attributes his results entirely to the neoarsphenamine. Boehm (309) reports recovery in 3 cases of trigeminal neuralgia following the use of a Vitamin-B preparation called "betaxin." He gave the substance by injection in quantities of one ampule at frequent intervals (daily to three times weekly). He based his treatment upon the principle of vitamin deficiency as a cause of nervous disorders. Admitting the limited number of cases and the brief period of observation, Boehm nevertheless enthusiastically recommends this method of treatment.

The use of hyperpyrexia has its adherents. Ball (1) used injections of boiled milk for a hyperthermic reaction. He treated 10 patients, with complete relief or great amelioration of their symptoms. Boeckheler (147) induced fever in 7 patients with "pyrifer" administered intravenously in gradually increasing doses. Six had relief for the period under observation. One recurrence was found to be due to a dental granuloma and thus, according to the author, the condition was perhaps not originally trigeminal neuralgia. He advocates a high fever peak of relatively short duration and notes that a focal reaction of increased pain in the trigeminus is to be desired. The greater the pain during the fever, the better and more permanent the result. The number of treatments necessary varied from four to seven or eight.

Possibly closely allied to the treatment by general hyperpyrexia is the use of local diathermy or short-wave therapy. Lux (19) described a method of "ganglionic diathermy" based upon the theory of a vascular disorder or spasm about the ganglion. The diathermy is applied by means of two electrodes, one in the oculotemporal region of the affected side, the other at the nape of the neck. From ten to twenty treatments usually sufficed to bring about disappearance of the symptoms. Hanau (103) praises the method of Lux, calls attention to its complete innocuity, and notes that 75 per cent of the patients had good relief and 25 per cent had more or less dolorous contraction from ten to twenty months after the treatments. He reports equally good results in recurrent cases and recommends the method for cases in which medication has not brought results, before more aggressive forms of treatment are undertaken. Koehler (275) used short-wave therapy (frequencies of from 50 to 20 million) in various affections of the face. He found it especially effective in affections of the trigeminus.

Moramarco (116) describes with technical particulars the diathermic and ionotherapic procedures for the treatment of trigeminal neuralgia. He indicates the good results in these cases obtained with ultraviolet, infra-red, and x-ray irradiations and reviews the different hypotheses offered in explanation of the action of these physical agents upon the neuralgia. Brunner-Ornstein and Guttmann (198) used the cold quartz lamp in 40 cases of trigeminal neuralgia, applying it under slight pressure for from two to four minutes at each of the points of exit of the trigeminal nerve. They advise three treatments weekly, to be continued for a short time after the patient is free from pain. Eight patients were reported as completely recovered, 15 as very greatly benefited, and 10 as distinctly benefited; 5 were still under treatment and in 2 the condition was refractory. Ausch (142) also recommends this method. Loewenstein (168) summarizes ten years' experience with the use of radium emanation in the treatment of trigeminal neuralgia. The method consists of the application of salve bandages of radium emanation absorbed in vaseline from one to two hours at a treatment, from two to three times a week. A check-up of 23 cases treated during the period from 1930 through 1932 enabled the author to conclude that in about one-third of the cases under discussion trigeminal neuralgia was banished by this method. Sgalitzer (292) gives in detail his technique for the x-ray treatment of this condition. Essentially his newer technique consists of many small doses, from 30 to 50 roentgens, given for ten to fifteen consecutive days. This seems to eliminate the objectionable pain after irradiation experienced by some of his patients when his previous method, employing a higher dosage, was used. He notes that any eventual recurrences at the end of two and a half or three months may be treated in the same way.

Surgical methods of treating trigeminal neuralgia would seem still to be the most satisfactory. They are favored by many from the first, and most of those advocating less radical methods suggest surgery after their own means have failed. No startlingly new surgical methods have been

devised in the period under review here. Numerous technical changes in older methods have been suggested as improvements in treating patients suffering from this condition. All these procedures may be said to be directed toward the de-afferentation of the area affected by the pain. The different methods of bringing this about all have their adherents.

Zenker (241) has carried on in Kirschner's clinic with the electrocoagulation of the gasserian ganglion, employing Kirschner's apparatus, by the use of which it is considered possible to have the puncture needle arrive in the exact point in the gasserian ganglion that requires treatment. The needle is replaced with the electrocoagulation unit and coagulation is carried out. Of 107 patients who were treated for trigeminal neuralgia, 13 returned because of recurrences, 11 of whom were treated before Kirschner's apparatus was in use. The author stated that in true recurrences it was a case of incomplete elimination of sensibility at the time of operation. In all cases of recurrence, further treatment brought about permanent recovery.

Complications in the form of oculomotor-muscle palsies, keratitis, and conjunctivitis were noted in some of their cases. Cooke (314) has devised an instrument for the permanent destruction of nerve fibers in the maxillary and mandibular divisions by electrocoagulation. Essentially it is a long small trocar-like needle through which may be passed a smaller needle for injection purposes or an insulated electrocoagulating element.

Injections of alcohol into the gasserian ganglion or the peripheral branches continue to be favored by many. Some consider these methods the preferential treatment in all cases and advise them to the exclusion of open surgical methods (57, 104, 266, 326). Others consider alcohol injection advisable as a means of temporary relief of pain for those patients who are unwilling or unable to have operative interruption of the tracts by which the painful stimuli reach the brain (172, 225, 270, 323).

Haertel (266) reports upon his cases of injection into the ganglion and notes some refinements in his technique. These consist mainly in the use of x-rays to localize the foramen ovale, through which the ganglion injection is made, and the use of smaller quantities of alcohol (not more than 0.3 c. cm.). Sixty-eight per cent of his patients had total permanent anesthesias, while 32 per cent had partial permanent anesthesias. Among those having total anesthesias, only 4 per cent had recurrences, while among those having partial anesthesias 70 per cent had recurrences. He states that when one plans a total anesthesia the injection should be made as near the sensory root as possible. Haertel answers the criticisms of his method by stating that the technique is not more difficult than other surgical means and in general the complications are less damaging than those at times following operation. He thinks the new method of coincidental x-ray examination and smaller dosages of alcohol removes the objections that the surgeon is working in the dark and that good results are obtained in the hands of only a few specialists.

Harris (104, 326) also makes a good case for the proponents of alcohol injection into the ganglion. He warns that just as operations upon the ganglion and root require a high degree of neurosurgical skill, so the injection of alcohol requires long practice and familiarity with the anatomy, the methods of injection, and their difficulties in order to produce the best results and should, therefore, be left to the hands of experts.

Irger (216) gives us a supplemental report of his method of injecting the ganglion, which he believes is superior to that of Haertel. It is an intramandibular approach in contradistinction to Haertel's extramandibular route. It is based on the finding that the foramen ovale is in a sagittal plane with the top of the articular tubercle of the mandible and in line with the angle of the jaw, thus forming an isosceles triangle which gives one the proper measurements and directions.

Putnam and Hampton (340) describe a modification of Haertel's method of injection into the ganglion in which the puncture is made during a brief period of anesthesia and the position of the needle is established by means of x-rays taken during the procedure.

Morris (65), having studied numerous anatomical specimens, reviewed the anatomy of Haertel's method. He believes the high "horizontal" Haertel route to be the most accurate and suggests that with its use it is the sensory root and not the ganglion tissue itself that is affected by the alcohol. If this is so, he states, the results obtained may be expected to be permanent and so compare with those obtained by major operation.

Horrax and Poppen (270, 271) advocate more alcohol injections preliminary to surgery. They would inject practically all cases for two main reasons: to make certain of the diagnosis and to adjust the patient to the anesthetic zone. Poppen (225) states that in dealing with trigeminal neuralgia one must remember that the treatment is largely a matter of choice, and that the patient should be permitted to choose the treatment he prefers, after the courses that may be followed,

alcohol injection or operation, have been thoroughly explained to him.

Van den Berg (299) has devised an instrument to be used as a guide for the needle during deep alcoholic injections into the mandibular or maxillary divisions. It is reversible and thus fits on either side of the head.

Flynn (261) has reported upon 150 cases treated by alcohol injection. The average duration of relief in his cases was seventeen months. This compares favorably with the duration of relief obtained by most other observers (270, 271, 323) making injections peripheral to the ganglion.

Emphasizing a possible increased risk in operations upon patients who have had previous alcohol injections, Wakeley and Reid (79) report a case of attempted operation via the temporal approach in which many dense adhesions were encountered in the neighborhood of the ganglion. A severe hemorrhage occurred in this area, and although it was finally controlled by packing, the patient succumbed. They attributed this complication to adhesions from many previous alcohol injections. Loessl (280), in the course of an operation for trigeminal neuralgia by the temporal route, found a cyst of the gasserian ganglion which he attributed to numerous previous alcohol injections. He notes that Lexer, Schmieden, and Peiper, as well as a number of other surgeons, met with such grave changes induced by alcohol injection that later operation became impossible. He cites these factors as the reasons why many surgeons prefer operation to alcohol injections.

Much of the progress made in the operative treatment of trigeminal neuralgia during the years under consideration has consisted in placing the procedure of partial section of the root upon a firmer physiological and anatomical basis. It goes almost without saying that practically all surgeons advise saving the motor root whenever possible and the root fibers to the ophthalmic division in most cases in which that branch is not primarily involved in the neuralgia.

From anatomical observations made upon ganglia and nerve roots of human adults, Van Nouhuys (130) sought to demonstrate that the sensory root of the fifth nerve is not composed of three parts that correspond to the three peripheral branches from the gasserian ganglion, and that since the operation of partial section of the sensory root is not based on anatomical facts, it cannot be regarded as an absolutely reliable procedure. Spiller and Frazier (184) summarize their anatomical and clinical evidence for the logic of the subtotal section. Wilkins and Sachs (188), in recording the areas of sensory loss following partial section of the posterior root in a series of 26 cases, found evidence that, while there was some interlacing and crossing of the fibers in a variable arrangement, in general the partial section could be performed satisfactorily by divisions. Also, Davis and Haven (156), by anatomical and embryological observations in the human being and by experimental sections in animals, demonstrated a rather definite pattern followed by the fibers of the various divisions in the posterior root, thus lending further support to the logic of partial selective section of the root.

Dandy (92) continues to favor the cerebellar route and cites its advantages as follows: an absence of keratitis, a lack of injury to the motor root, no injury to the facial nerve, and a possibility of uncovering tumors causing neuralgia without giving rise to other symptoms. Van Wagenen (78), in a report of 5 cases operated upon by Dandy's method, was impressed with the idea that, while the operation is considerably more hazardous and difficult than that through the temporal route, it is a valuable adjunct to the neurosurgical armamentarium. He found no evidence that the type or area of anesthesia differed from that which occurs when the trigeminal root is sectioned via the temporal route if the root is totally divided. In 2 instances where only the lower half of the root was sectioned he found a preservation of sensation over the face in all but a few localized areas.

Stibbe (348) thinks that his experimental work on monkeys shows a crossing and a segregation of the fibers in the sensory root of the fifth nerve into spinal and principal nucleus fibers, which division can properly be interpreted as a functional division into pain and touch fibers. He further found a large number of sensory nerve cells in the sensory root. These were in scattered groups, often quite close to the pons. Thus he believes that section of the root distal to these, as practiced by Frazier, does not rule out the possibility of regeneration of the fibers. Peters (285) also found sensory nerve cells in the posterior root of both man and animals, which he believed offered a possible explanation of the return of sensation in some cases operated upon with section of the root near the ganglion.

Two new methods of approach to the ganglion or sensory root have been described. Ruttin (28) has devised a technique by means of which the ganglion may be approached surgically either for removal or for injection. It consists of incision over and behind the ear and removal of the bone of the upper wall of the auditory canal and part of the floor of the middle fossa, without opening

of the tympanic cavity. The dura is then elevated off the floor of the middle fossa as far as the tip of the pyramid and over the ganglion.

Maxwell (335) describes a procedure which permits section of the root in the posterior fossa with a temporal approach. He makes the regular temporal opening, and lifts the dura back as usual to sever the middle meningeal nerve at the foramen spinosum and to identify the third division at the foramen ovale. Using the latter as a guide, he elevates the dura posteriorly and medially to a point on the petrosal crest between the trigeminal groove and the internal acoustic meatus. The petrosal sinus is then lifted and the dura separated from the posterior petrosal surface for a distance of about .25 in. An incision through the dura beneath the petrosal sinus in this location permits access to the root in its course between the pons and the cave of Meckel. The author clamps and cuts the root in this location and avulses the proximal segment from the pons.

From the standpoint of the surgical anatomy of the temporal approach, Chang (251) records what he considers a possible difference between the Eastern and the Western skull as regards the morphology of the middle fossa. He states that the bony eminence frequently found in front of or hiding the foramen ovale in the Western skull has never been noted by him in Eastern skulls.

Frazier (53), in a general summary of his experiences with 654 radical operations for trigeminal neuralgia, gives us a very thorough and favorable report on this method of treating the condition. He notes, among other complications frequently following the radical procedure, the herpetic eruption which may appear on the face and buccal cavity, usually in the distribution of the maxillary division, about the second or third postoperative day. He notes, as have many others, that the occasional facial palsies following the radical operation tend to disappear in practically all instances.

Some unusual sequelæ of the radical operation have been reported during this period. Loveman (169) found a rare sequel in the form of a zosteriform ulceration and alopecia in the area of anesthesia produced by the operation. Clinically some of the ulcers resembled carcinomas, but histologically they revealed only acanthosis and pseudo-epitheliomatous hyperplasia. Following x-ray therapy all of the ulcers healed. Netherton (174) reported a case in which a subtotal section of the root including the first and second divisions had been carried out. A year later erythematous plaques developed over the anesthetic area. They varied in acuity but remained permanent.

It is difficult to generalize regarding the best method of treating trigeminal neuralgia at the present time. Proponents of both the injection method and the operative method have much in their individual favors. Many are inclined to agree with Taylor (187), who concludes that radical operation is safer than alcoholic injection of the ganglion. The latter procedure, as we may note, at times affords comparatively permanent relief (Haertel, 266), but not in all cases (Loessl, 280), while practically all agree that deep injection of the peripheral branches is a relatively temporary procedure. In this regard, Jefferson (62) states: "The claims of alcohol injection have been most ably and convincingly pleaded in this country; but sufficient evidence is now available to show that operation is in general superior to injection, and should therefore be more widely employed." Similarly, Paterson (339), after an inclusive review, advocates partial section of the sensory root in all cases fit for a general anesthetic, reserving alcohol injection for patients who because of age or general condition are unfit for surgery.

SUMMARY

In the past few years much has been accomplished in increasing our knowledge concerning the mechanisms involved in the mediation of painful sensations. The exact etiology and pathology of trigeminal neuralgia, however, is still obscure.

Diagnosis of the syndrome has been placed upon a fairly satisfactory basis.

Methods for the relief of the suffering patient have far outstripped our basic understanding of the condition. It is possibly to be regretted that relief from the pains of trigeminal neuralgia must be accompanied by a loss of some types of sensory perception over the affected zones. May we hope that, as our knowledge of the condition increases, even better methods of treatment will be evolved.

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## BRAIN AND ITS COVERINGS; CRANIAL NERVES

**Pilcher, C.: Experimental Cerebral Trauma: The Fluid Content of the Brain After Trauma to the Head.** *Arch. Surg.*, 1937, 35: 512.

In an effort to determine the effect of trauma to the head on the fluid content of various portions of the brain and on the volume outflow of cerebrospinal fluid, as well as to determine the effect of the intravenous administration of hypertonic solution of dextrose in traumatized animals, Pilcher devised an extensive plan of experimentation on dogs, the brain of which he traumatized under constant conditions. He was repeatedly able, by dropping a 500 to 1,000 gm. weight on the head from a height of 60 inches, to produce sufficient cerebral injury to effect a definite elevation in the cerebrospinal fluid pressure. The fluid content, which had been studied separately for the gray and white matter, was only slightly increased, if at all, above the average normal level. The small average increase in cerebral fluid content was not believed to be sufficiently great to account for the elevation of the cerebrospinal fluid pressure. Therefore, contrary to the more prevalent idea, the author believes there is no conclusive evidence to prove the existence of marked cerebral edema following craniocerebral trauma. It is his opinion that other factors, viz., a possible alteration in the volume of the intracranial blood, or of the cerebrospinal fluid content, may be the cause of increased intra cranial pressure, and that these are of greater importance than the so-called cerebral edema in such trauma. JOHN MARTIN, M.D.

**Robertson, E. G.: Epilepsy as a Symptom of Organic Lesions of the Brain.** *Med. J. Australia*, 1937, 2: 331.

In idiopathic epilepsy the cause is, as yet, undiscovered; in the symptomatic form one of the many known causative factors is present. In considering many of the problems of epilepsy, one should remember that there is an underlying "epileptic tendency," in the presence of which many factors may precipitate an epileptic attack.

Epilepsy arising from organic lesions of the brain may have some localizing symptoms; these depend upon the site of the lesion. Those arising from the precentral convolution or premotor area are of the nature of *petit mal*, simple loss of consciousness and generalized convulsion with or without the turning of head and eyes to the opposite side. If the attack arises in the "frontal adversive field," the turning of the head and eyes may precede the loss of consciousness. The further the lesion is placed anteriorly, the less is the tendency to strong preliminary deviation of the head and eyes. If the focus is in the postcentral convolution the sensation spreads in a manner corresponding to the grouping of the cells there, and motor convulsions are apt to end the attack. If the focus is in the receptor cells of the occipital lobe, the aura is a crude visual one, usually of colored or uncolored lights, while if it is situated more anteriorly or the process spreads, visual disorientation may be a component of the attack. In the temporal lobe, auditory hallucinations are present; these may rarely consist of formed words, or sometimes the patient notes "a silence" as a part of the attack. If the focus is in the left side in right-handed persons, inability to speak with subsequent nominal aphasia may be prominent. Uncinate attacks are epileptiform in character and manifest themselves in many ways. The patient may complain of various odors or bad smells though often he will not admit of an olfactory aura. Many cases will be missed if the physician waits for a fully described attack. With these attacks there may be a dreamy state as in other forms of epilepsy with "turning inward of the consciousness."

The later in life that the epilepsy has its onset, the more likely that a definite cause may be found. Among the pathological lesions that may initiate the condition, cerebral tumor is the commonest cause of epilepsy beginning in middle life. Any form of tumor may cause epilepsy. In older persons intracranial aneurysms are a commoner cause than is usually realized. In the presenile period, cerebral degenerative lesions are a common cause of the condition. Traumatic damage and vascular degeneration are likewise fairly common causes of epilepsy. In early life there may be varied causes, such as developmental defects, birth injuries, embolism, hemorrhage, sclerosis, cystic degeneration, and infections of various sorts.

The exact nature of the epileptic process is poorly understood. The electro-encephalograph has opened a door to the study of the condition, but as yet it is too early to know whence it will lead.

In the treatment of the condition it is important that vigorous measures be taken early in the course of the disease, for every attack facilitates the occurrence of others. The use of anti-convulsant drugs in sufficient dosage is indicated. The best of these are bromides and phenobarbital. Organic lesions should be attacked surgically if this is feasible. JOHN WILTSIE EPTON, M.D.

**Craig, W. McK.: Facial Paralysis and Its Surgical Treatment.** *Surg. Clin. North Am.*, 1937, 17: 1093.

Facial paralysis may be acute or chronic, central or peripheral. A spontaneous cure may occur with expectant treatment or after the removal of a causative factor, but the paralysis may persist in spite of treatment. If signs of improvement do not occur within six months, the chances of a spontaneous cure are very slight and surgical measures should be considered.

Many operative procedures have been recommended, including dissection, suture, graft of the facial nerve in the facial canal, suture of the facial nerve to other cranial nerves, especially the spinal accessory or the hypoglossal, and removal of the superior cervical sympathetic ganglions. Each case should be considered very carefully before any surgi-

Fig. 1. Schematic drawing representing: (a) suture of the proximal end of the spinal accessory nerve to the distal end of the facial nerve; (b) suture of the proximal end of the descendens hypoglossi nerve to the distal end of the spinal accessory nerve, and (c) division and resuturing of the superior cervical ganglion. These three procedures are done to promote recovery of facial movements, to prevent atrophy of the muscles supplied by the spinal accessory nerve and to produce temporary enophthalmus.

cal procedure is attempted, and the operation best suited to the case should be used. Nerve suture, either alone or with cervical sympathectomy, seems to be the most efficacious method of overcoming the deformity.

## SPINAL CORD AND ITS COVERINGS

**Paltrinieri, M.: Paralytic Sciatica from Posterior Herniation of a Degenerated Lumbar Disc** (Sciatica paralizzante da ernia posteriore di un disco lombare degenerato). *Chir. d. organi di movimento*, 1937, 23: 97.

Paralytic sciatica, according to Putti, is characterized by dissociated, usually unilateral paralyses or pareses of the external popliteal nerve occurring after attacks of sciatica which have recurred over many years. Once established, the paralysis does not regress. In 1936 Paltrinieri published a report of 17 cases of this syndrome due to various diseases of the lumbar segment, such as congenital defect and spondylitis. He has seen it also in 4 other patients with tuberculosis of the lumbar spine, especially of the transverse processes. When a motor defect in the distribution of the sciatic nerve is associated with pain and trophic and sensory disturbances, one should be cautious in considering that the compression is in the spinal foramen and should turn the attention to the vertebral body, disc, and meninges, which are closely connected with the cauda equina.

The author reviews the reported cases of unilateral compression of the roots of the cauda equina due to a herniated disc, reviews the symptomatology and diagnosis, and adds another case. He believes that

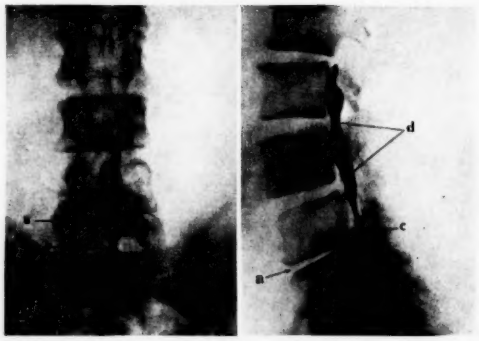


Fig. 1. (a) Disc undergoing fibrous degeneration; (b) narrowing of the lipiodol column at the level of the fifth lumbar vertebra, due to concomitant arachnoiditis; (c) bending of the lipiodol column; and (d) posterior impressions on the opaque column of the discs between the second and third and the third and fourth lumbar vertebræ.

the purely mechanical theory is insufficient, and that an alteration of the disc always precedes its retropulsion. The roentgenogram is not always decisive, either because the disease of the disc is early, or because traumatic changes predominate. In such cases myelography gives more information than radiography.

The author's patient was a woman fifty-three years old who had suffered from intermittent left-sided sciatica for ten years. After an especially acute attack she developed drop-foot, equinus and muscular atrophy, associated with hypo-esthesia of the antero-external surface of the leg and dorsum of the foot. The spinal fluid was normal as to composition and pressure.

The roentgenogram (Figure 1) showed narrowing of the space between the fourth and fifth lumbar vertebræ, eversion of their anterior free margins, and arrest of the lipiodol column at the level of the fifth lumbar vertebra, with a "rat-tail" thinning, and a "bullet" appearance in the meningeal cul-de-sac. In the lateral view, a bending of the column between the fourth and fifth bodies was seen, apparently caused by the protrusion of the disc into the cavity.

The patient refused a laminectomy.

The article is accompanied by roentgenograms, an anatomical diagram, and references.

M. E. Morse, M.D.

## SYMPATHETIC NERVES

**Valdoni, P.: Alcohol Injection of the Splanchnic Nerve and Thoracic Sympathetic Chain in the Treatment of Hypertension** (L'alcoolizzazione del nervo splancnico e della catena toracico-simpatica nella cura della ipertensione). *Policlin.*, Rome, 1937, 44: sez. chir. 538.

Valdoni describes the technique of alcohol infiltration of the splanchnic nerve by the supradiaphrag-

matic approach, which he prefers. His studies on the cadaver demonstrate that with this method the liquid diffuses upward to the sixth dorsal vertebra, infiltrating the corresponding ganglia, and, taking in the lesser splanchnic nerve, is arrested below at the pillars of the diaphragm. In the living subject, roentgenograms after injection of uroselectan B show diffusion along the opposite side of the spine to the level of the sixth vertebral body and into three intercostal spaces on both sides following the nerve, and penetration downward to the first lumbar vertebra.

He reports 62 cases of hypertension treated by alcohol infiltration of the left splanchnic nerve. In one-half the cases no secondary phenomena occurred, while in the others on the third or fourth day there were pains localized deep in the spine, unrelated to position or movement, and usually nocturnal. They were possibly due to the action of the alcohol on the periosteum, and disappeared between the eighth and tenth days.

The blood pressure dropped from 30 to 40 mm. within a few minutes after injection, and in a considerable number of patients this decrease continued. The results after a number of months depended on the underlying condition. They were very gratifying in cases without anatomical lesions, particularly the hypertension of diabetes without renal lesions. The effect in successful cases appeared to last more than a year, but further observations are necessary for more exact data. In 3 cases in which there was no improvement after alcohol injection, resection of the splanchnic nerve was also without result.

The author believes that the simple and harmless procedure of alcohol infiltration is not only the means of obtaining an immediate therapeutic effect, but also the most reliable criterion for the selection of cases suitable for splanchnic resection. If infiltration is unsuccessful, more complicated interventions are unjustifiable. A permanent decrease in the blood pressure is, however, an indication to consolidate the result by resection. The operation should be limited to resection of the splanchnic nerve and the pole of the semi-lunar ganglion to which it is distributed.

The article is accompanied by illustrations and references. M. E. Morse, M.D.

# SURGERY OF THE THORAX

## CHEST WALL AND BREAST

**Hintze, A.: The Occurrence and Prevention of Metastases as Judged from Carcinoma of the Breast** (Rezidiv und Metastase-Entstehung und Verhuetung, dargetan am Beispiel des Mammacarcinoms). *61. Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1937.

The spread of metastases from a breast carcinoma depends on the location of the primary growth. If the growth is lateral and distal to the thorax or medial and proximal to the thorax the axillary glands, in 85 per cent, or the parasternal glands, in the sternomastoid angle, or the mediastinum, in 15 per cent, will become affected next. The spread then continues into the lung and pleura and then through the mediastinum into the lung and pleura on the opposite side, as well as through the lymph vessels into the lymph glands on the opposite side. This is demonstrable in the roentgen film. A spread to the axillary glands and other breast may also occur by way of the cutaneous lymphatics without affecting the other lung. From the mediastinum there may be a spread through the para-aortic and paravertebral glands into the abdomen to produce metastases in the peritoneum and omentum. The growth may also spread into the liver, pancreas, kidneys, stomach, or spleen. It may follow the lymph vessels which accompany the blood vessels, and thus reach the skeletal system, first invading the thoracic spine, the lumbar spine, then the pelvis, and the upper portion of the femur. These various types of spread may be observed singly or in combination.

The endocrine glands appear to play a special part in the metastasizing process. The hypophysis, thyroid, adrenals, and the ovaries are often involved, far more than would be suspected from the size of these glands, and often symmetrically. The endocrine glands must, therefore, be considered as carcinophilic; the spleen and the skeletal system as carcinophobic. It is characteristic that the pectoralis muscle and the intercostal muscles are easily eaten away by the growing tumor, while distant metastases in the muscles are practically unknown. The direct spread may be compared to the advance of an army which overcomes all obstacles in its way, while the distant metastases occur as vessel emboli of which thousands perish before one successfully starts growing. This constant throwing out of pieces of tumor tissue with their resulting decomposition produces a protein reaction which is the cause of the cachexia. The patient, therefore, does not die from the metastases which he has, but rather from the metastases which he does not have, as they constitute the cause of the foreign protein reaction.

The character of the recipient tissue is of utmost importance for the settlement of carcinoma cells in the different tissues and their prognosis. The carcinomas of a low degree of differentiation are in marked contrast to those of high differentiation. Of the former group the most virulent is the diffuse carcinoma which produces a marked inflammatory reaction. The author has never secured a cure in cases harboring this type. On the opposite end of the scale is the colloid cancer, in cases of which the author has secured a 100 per cent five-year cure and many ten-year cures. The majority of the cases present carcinomas with a moderate degree of differentiation. Of the cases of carcinoma solidum simplex, the author was able to cure 40 per cent for the five-year period. In cases of medullary carcinomas as well as scirrhous types he obtained a five-year cure in 29 per cent. Of the patients with adenocarcinoma, 50 per cent were alive at the end of five years.

The scale of differentiation of the carcinoma was also visible in the rapidity of the spread and the number and size of the metastatic processes. The same scale appeared to bear some relationship to the age of the patient in which the carcinoma made its appearance. In the cases of colloid carcinoma the average age of the patient was sixty years, while in adenocarcinoma it was fifty-three and two-tenths years. The average age of the patient with carcinoma simplex was forty-eight and eight-tenths years, while in inflammatory carcinoma it was thirty-five years. The circumstances which enhance or delay the spread of cancer may be summarized in the following manner:

Cancer may be favored by:

1. Youth, pregnancy, and lactation
2. Location in the medial or lower quadrant of the breast
3. A low state of differentiation
   a. Small-cellular growth
4. Trauma, palpation, and massage
   a. Incomplete surgery
5. Lowered resistance

Cancer may be retarded by:

1. Advanced age, senile involution
2. Location in the lateral segment
3. Higher differentiation
4. Colloid degeneration
5. Radical surgery with pre-operative and post-operative radiation
6. Raising of the hormonal resistance

The author considers the best weapons against breast cancer to be radical surgery and radiation, preferably combined. Only by the use of prophylactic radiation may the metastases be reduced. The author remarks that the operation as well as the radiation produces certain biological changes in the organism. Thus the purely operative results improve till the fifth decade and then gradually decline. The prophylactic radiation improves the results about 75 per cent. The results also improve until about

the fifth decade, but fall little thereafter. Beginning about the sixtieth year the results gradually improve so that the results are from 100 to 150 per cent better than those where no prophylactic radiation has been administered.

These results are so markedly different that one cannot ascribe them to the limits of error. Of a total of 1,125 cases of mammary cancer in the female, the five-year cures in those without radiation were 29.8 per cent, and the ten-year cures 15.4 per cent; in those with prophylactic radiation the five-year cures were 52 per cent, and the ten-year cures 34.1 per cent. This difference was seen in the author's cases over a period of twenty years. During the individual years, the results showed small differences, but the prophylactically radiated cases always showed a far better result. In three time periods the results were 20 per cent in 1912, 26 per cent in 1921, and 31 per cent in 1927 for the non-irradiated cases, while in the irradiated cases they were 50.0, 52.6, and 55.3 per cent, respectively. Therefore, if prophylactic irradiation were practiced throughout Germany, many lives would be saved each year.

WILLIAM C. BECK, M.D.

## TRACHEA, LUNGS, AND PLEURA

**Eloesser, L.: Blocked Cavities in Pulmonary Tuberculosis.** *J. Thoracic Surg.*, 1937, 7: 1.

The author summarizes his article on blocked cavities in pulmonary tuberculosis as follows:

Tuberculous bronchial stenosis and especially stop-valve stenosis play a rôle in the production of excavation. Destructive ulceration of the more rigid pulmonary framework and inflation of the resilient lung lead to excavation. Cavities produced in this way are spherical and present "annular shadows."

The diagnosis of obstruction of a cavity may be made: (1) by means of radiography with and without opaque substances, (2) by needling, and (3) by bronchoscopy.

In the treatment of this condition suction drainage has been disappointing; the results of thoracoplasty are doubtful; and thoracoplasty with apicolysis is inadvisable.

Open packing has been found to be curative, but it is restricted in its application and troublesome. The possibility of resection of the cavity or lobectomy is considered. CARL R. STEINKE, M.D.

**Neuhof, H.: The Free Transplantation of Fat for the Closure of Bronchopulmonary Cavities (Lattice Lung).** *J. Thoracic Surg.*, 1937, 7: 23.

The features of the lesions for which fat transplantation has been employed are described briefly, the technique is indicated, and the reports of 17 cases in which the operation was employed are given.

The criteria for a successful free tissue graft are a sterile field, a bed capable of vascularization, and a field free from dead spaces, in which immobilization is feasible after transplantation. None of these criteria existed in any of the reported cases.

Concerning the results, complete healing occurred in 11 cases. The result could be termed a partial success or partial failure in 3 cases, and a complete failure in 3. The sizes of the cavities varied greatly. Some of the cavities were of recent origin and others of long duration.

Neuhof states that there have been several additional cases of fat transplantation, all successful, since this article was prepared for publication.

CARL R. STEINKE, M.D.

**Pruvost, P., and Quénu, J.: The Exploration of Large Pulmonary Abscesses by Means of Transparietal Injection of Lipiodol** (L'exploration des grands abcès pulmonaires par l'injection transpariétale de lipiodol). *Presse méd.*, Par., 1937, 45: 1397.

Pruvost and Quénu note that radiologists generally admit that it is impossible to introduce lipiodol into a pulmonary abscess by way of the bronchi except in the case of bronchiectatic abscess. However, if treatment by drainage of the abscess cavity without lobectomy or pneumectomy is contemplated it is evident that roentgenological examination by the usual methods does not give sufficient data for the guidance of such an operative procedure. Such data in regard to the extent of the abscess and the site most favorable for drainage can be obtained by roentgenological examination after injection of lipiodol into the abscess cavity through the wall of the thorax. This method is not suitable for all types of pulmonary abscess, but is used especially for large and superficial abscesses.

In the use of this method, the first procedure necessary is to make plain roentgenograms in two positions, the anteroposterior and the lateral. This indicates the position of the abscess and the fluid level. The lipiodol is then introduced into the abscess cavity, as located by these roentgenograms, with a needle attached to a syringe, and not with a trocar. This method involves no injury to the lung tissues. When the needle is introduced, pus is withdrawn from the abscess cavity, and from 5 to 10 c.cm. of lipiodol are injected. After the injection of the lipiodol, roentgenograms are made with the patient in various positions: with the patient seated, the anteroposterior and lateral roentgenograms; with the patient in dorsal decubitus; and with the patient lying on the unaffected side.

The authors report 2 illustrative cases with roentgenograms showing how clearly the latter revealed the size and shape of the abscess cavity after the injection of lipiodol. In both cases drainage was successfully carried out, and roentgenograms which were taken after the wound was closed showed that the abscess cavity had disappeared. In both cases the lipiodol clearly demonstrated the presence of a fistula between the abscess and a bronchus, and showed clearly the size and course of this fistula. In 1 case it also demonstrated a diverticulum from the main abscess cavity, which, incompletely drained by the drainage of the large cavity, caused a recur-

rence of the symptoms. As the position of this diverticulum was clearly shown, it was also drained, with complete and permanent relief of the symptoms.

Repeated roentgenograms showed that the lipiodol disappeared rapidly from the pulmonary tissue, while lipiodol introduced into the pleural cavity often persisted for many months. The authors conclude, therefore, that the transparietal injection of lipiodol into a pulmonary abscess, if superficial, is practically without danger; moreover, it facilitates satisfactory drainage of the abscess, which results in the cure of lesions that are otherwise very difficult to treat successfully. ALICE M. MEYERS.

## HEART AND PERICARDIUM

**Shipley, A. M.: Pericarditis.** *J. Am. M. Ass.*, 1937, 109: 1017.

This paper is limited to the discussion of the various types of pericarditis.

In coronary thrombosis, pericarditis with effusion is sometimes present. This may be confined to the area of infarction and the amount of fluid may be very small. Occasionally, however, it is large.

Suppurative pericarditis is not rare. There are two chief avenues of approach for drainage, the anterior and the posterolateral. The anterior operation may be trans-sternal, right or left parasternal, chondroxyphoid, or a combination of the trans-sternal and left parasternal types. In late cases with a large amount of effusion, a posterolateral approach may be made by resection of the seventh rib near the midaxillary line. The pericardium is adherent to the pleura, but pericardotomy is possible without producing pyopneumothorax.

Tamponade of the heart is associated with pericarditis with effusion, both purulent and serous, and with constrictive pericarditis. Tumor of the heart, while rare, may cause serious compression of the heart, either because of the presence of the tumor itself or because of effusion. Tamponade may be acute or chronic. It is most dramatic in acute hemopericardium, especially if there is a penetrating wound into one of the cavities of the heart.

Chronic adhesive pericarditis may be of four types. There may be adhesions between the two layers of the pericardium, without constriction and without fixation of the outer layer. Another type without serious cardiac disturbance is seen in pulmonary tuberculosis with adhesive pleuritis; the pleura or diaphragm is fastened to the outer layer of the pericardium. Constrictive pericarditis is chronic. The resected pericardium shows the visceral and parietal layers to be fused and indistinguishable, with densely fibrous and hyalinized tissue which is poorly vascularized. Some of the cases show focal areas of calcification. Tuberculous pericarditis may be classified into three groups: (1) acute, in which effusion predominates; (2) subacute, in which adhesions and thickening are outstanding; and (3) chronic, in which fibrosis and constriction are present.

Mediastinopericarditis is a condition which is often confused with constricting pericarditis. It does not often follow pericardotomy for pyopericardium. In mediastinopericarditis, the heart, pericardium, wall of the chest, and diaphragm are all bound together, and during systole the heart contracts against a pull that is unyielding as far as the wall of the chest is concerned, and both the wall of the heart and the diaphragm are hampered in their movements. J. DANIEL WILLEMS, M.D.

## ESOPHAGUS AND MEDIASTINUM

**Eliason, E. L., Tucker, G., and Thigpen, F. M.: Esophageal Diverticula.** *Surgery*, 1937, 2: 188.

The authors give a brief historical survey of esophageal diverticula with particular reference to the one-stage and two-stage types of procedures and their respective attributes. They then report the cases of 10 patients who were operated upon during a twelve-year period, from 1922 to 1934. Seven of these were males ranging in age from forty-two to seventy years, and 3 were females ranging in age from sixty-five to sixty-eight years. The chief symptoms were dysphagia, regurgitation (always more marked when lying down), and cough. The authors stress the importance of roentgenoscopic and fluoroscopic studies and esophagoscopic examination in the diagnosis of esophageal diverticula, and recommend the passage of an esophagoscope under the guidance of a string which has previously been swallowed. They consider the one-stage operation with the aid of the esophagoscope as the procedure of choice and utilize avertin as an anesthetic.

Among the 10 patients operated upon, there was 1 death, giving a mortality of 10 per cent. Post-mortem examination in this case revealed atelectasis of the lower lobe of the left lung, lobar pneumonia of the right upper lobe, and bronchial pneumonia of the right lower lobe. Mediastinitis did not occur in any of the patients. Of the 9 patients who recovered, 8 were followed. Two were entirely symptom-free at the end of four and six months, respectively. Five, who have been followed for periods of from one to six years, are perfectly well. One might possibly be considered as having a recurrence because of statements made by this patient in a letter, although he was not seen or examined by the authors. The authors were unable to obtain any information concerning one patient. ALTON OCHSNER, M.D.

**Oppenheimer, A.: Esophageal Varices.** *Am. J. Roentgenol.*, 1937, 38: 403.

The roentgenological appearance of esophageal varices is the product of two variable factors: (1) the anatomical formation, and (2) the actual physiological condition during the exposure of the film. Anatomically the roentgen findings vary greatly with the stage of the disease. Three groups stand out: (1) the early stage, marked by slight and diffuse venous congestion and resulting in moderate broadening of the rugæ of the lower esophagus; (2) the beginning of

dilatation of the larger individual veins which emerge from the submucosa into the mucosal relief; this stage is marked by small rounded defects seen in the relief of the lower fifth of the tube; and (3) generalized enlargement of numerous veins which encroach upon the mucosa. In this period a typical vermiform shadow predominates.

Varices vary in caliber according to influences acting upon their filling. Definite variations in size and extent are produced by peristalsis, especially stripping, and by the mechanical pressure of a large bolus. In either case blood is forced into the lower vessels. In early portal congestion the blood can still pass into the abdominal veins. Later it is squeezed from upper varices into lower ones, overfilling the latter. This mechanism in the early stages makes the esophageal varices invisible and in advanced stages makes visible only a part of the whole extent. Roentgen examination, generally, does no more than affirm the clinical diagnosis in advanced stages, while in early congestion the clinical recognition often depends on roentgen findings only. It is necessary, therefore, to demonstrate the mucosal relief of the esophagus when it is unaltered by peristalsis or mechanical compression. Technically speaking, the best visualization is present during the short interval between swallowing and peristalsis.

As a part of the thoracic veins the esophageal varices fill on inspiration. For this reason it is always advisable to expose films during forced inspiration.

The retardation of the passage through the esophagus, a common finding in varicosis, varies between a few seconds and several hours in the terminal stages of the disease. It is often due only to mechanical obstruction by the varicose mass. However, there are functional disturbances which also affect the cardia and cause esophageal stasis.

J. Daniel Willems, M.D.

**Moersch, H. J.: The Treatment of Carcinoma of the Esophagus by Means of Surgical Diathermy.** *J. Thoracic Surg.*, 1937, 7: 43.

In spite of the voluminous literature dealing with the problem of the surgical treatment of carcinoma of the esophagus, the end-results obtained by this method have been distinctly discouraging. The greatest obstacle to reaching a successful solution of this problem has been the factor of early diagnosis.

Early diagnosis is complicated by the fact that carcinoma of the esophagus is very insidious in its onset and is usually well advanced before it produces symptoms. To add to the difficulty, the tumor is usually of a high degree of malignancy. That there is room, however, for progress in the field of diagnosis is apparent from a review of the case histories of 447 patients seen at the Mayo clinic during a four-year period. The average duration of symptoms before the patient came under observation at the clinic was seven and one-tenth months. It is therefore apparent that early diagnosis is the exception rather than the rule.

In dealing with large numbers of patients suffering from a disease such as carcinoma of the esophagus, one is bound by the laws of chance to encounter occasionally a case in which the disease is in a relatively early stage of development. The case presented by the author belongs to this group and illustrates what might be accomplished by the use of surgical diathermy.

## MISCELLANEOUS

**Singleton, A. C.: Eventration of the Diaphragm.** *Brit. J. Radiol.*, 1937, 10: 677.

This unusual condition may be defined as a marked protrusion of one dome of an intact diaphragm into the thoracic cavity. The term "eventration" in its accepted usage is reserved for those cases of high diaphragm which are not the result of thoracic or abdominal disease, nor of operative or traumatic interferences with the phrenic nerve.

The etiology of the condition is unknown, but the consensus of opinion is that it is probably congenital. Eventration is rarely responsible for clinical symptoms. The diagnosis is made by fluoroscopic examination with a contrast medium in the stomach. The hemi-diaphragm on the affected side remains stationary, whereas the other half moves normally. The author reports 4 such cases seen at the Toronto General Hospital, Toronto, Canada. He discusses the differential diagnosis, but does not recommend a particular form of therapy. Paul Merrell, M.D.

**Rehn, E.: The Stabilization of Intrathoracic Pressure in Surgery** (Ueber intrathorakale Druckstabilisierung in der Chirurgie). *61. Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1937.

Safety and progress in thoracic surgery are coincident with the control of intrathoracic pressures Practical control must be based upon known and accepted laws of physics. One must consider that the rise and fall of intrathoracic pressure has a significance other than its direct action upon the breathing and circulatory mechanism. With the contraction and expansion of the lung, impulses are set up, which control and direct the respiratory mechanism. In this reaction every change in intrathoracic pressure is projected to the active respiratory mechanism (Hessian reflex). This is of significant importance for the understanding of changes in the pressure and their therapeutic indications.

The surgical stabilization of the intrathoracic pressure can be produced in several different ways: (1) by maintaining the normal differences in pressure; (2) by the artificial production of adhesions between the visceral and parietal pleura (this may be done either by the use of the Mikulicz tampons as recommended by Sauerbruch, or by the pneumopexy recommended by the author. The second method is possible only if the first method is active; that is, the lung may not be collapsed); and (3) by artificially fixing the upper anterior mediastinum, either intrapleurally or extrapleurally.

The author does not discuss the first two methods. It is well known that one can safely perform intrathoracic surgery if the mediastinum is fixed and will not swing from side to side. This led the author to investigate the possibilities of artificially stiffening this body. As this required a demonstration of the mediastinum, mediastinography was developed. From the experiences in his clinic, the author recommends kymography, which can be done with or without the injection of 5 c.cm. of abrodil. The injection of this substance is valuable as the outer borders of the mediastinum may be fixed by adhesion, while the inner portion is free to move. If this is the case and the adhesions are freed, a catastrophe may occur.

For stiffening the mediastinum, vivokol appears to be better than salt solution, but it is not sufficiently viscous. In the search for a more suitable material, the author came upon a substance which not only fills all requirements, but possesses qualities which make it valuable for all forms of packs. It is polyvinyl alcohol, the basis of Braun's syntophyl, first described by Hermann and Haenel and related to synthetic rubber. It is absorbed by the tissues. The faculty of resorbability is also possessed by its solvent, water. The pack contains 94 per cent water, is of rubbery consistency at body temperature, and is liquid at from 45 to 50 degrees. It can be introduced by either gravity or injection with a syringe. It hardens rapidly. It can be readily sterilized by heat. Careful investigations by Pfannenstiel have shown its entire indifference to all human secretions. By the addition of medicaments, bactericidal, and other activities can be induced.

Animal experimentation showed reactionless healing of the injected area. The absorption takes place from the surface by slow phagocytosis. When polyvinyl is injected into the mediastinum of a cat with a large thoracic window, mediastinal flutter stops almost immediately. With 20 c.cm. injected into the mediastinum a large window may be opened into the chest without fear of mediastinal flutter. This same amount will produce a stiffening of the mediastinum in the human.

In the first case described there was a traction diverticulum of the esophagus at the level of the bifurcation. The mediastinum was stiffened preoperatively, which made it very easy to operate with a collapsed lung. The lung was expanded before the thorax was closed. Cure was obtained.

In the second case the mediastinum was also stiffened. Chondromyxosarcoma with involvement of the lung was found. The thoracic wall was removed and the lung was partially resected. There was an open pneumothorax. The patient easily withstood a bad phlegmonous pleural infection.

In view of the excellent results obtained in these two cases the author believes that the stiffening of the mediastinum should be used when it is difficult to maintain the normal differences in the intrapulmonary pressure, or when an open pneumothorax may be expected in the postoperative course. He uses this method in all cases of pulmonary collapse when the kymogram reveals a mobile mediastinum or when this condition is merely suspected. After obtaining good results with this material in the mediastinum, the author began to use it for packs in thoracic surgery. Animal experiments showed it to be reactionless in the pleural and extrapleural spaces. If more than one half of the thoracic space was filled with the material care was required to observe the amount of exudate. This could, however, be removed by paracentesis.

The physical action of the pack demanded clinical proof and the following case afforded the author the opportunity to study this. The patient presented a pyopneumothorax following rupture of a cavity into an oleothorax. He was in an asphyctic condition from a bad bilateral phthisis, complicated by myocarditis. After the pleura was emptied and filled with polyvinyl, the diseased half of the lung could be immobilized. The cyanosis decreased and the pulse rate improved. After eleven days the patient died of myocarditis. Autopsy showed the lung to be covered by the pack which separated it from an empyema. The immediate picture after the injection was as fine as is seen following a pneumothorax performed under the most favorable circumstances.

Following this unquestionably good result, the method was introduced whenever collapse therapy was indicated, especially in pulmonary tuberculosis. It was used in combination with partial thoracoplasty, apicolysis, and for the purpose of making a pack in bronchiectases and an inferior intrapleural pack for collapse of the lower lobe. This shows the universal action of the pack.

After using the material for one-half year, the author concludes that polyvinyl alcohol is a splendid material for a pack, that it not only has the property of being slowly absorbed by the tissues, but also has a beneficial specific and non-specific effect upon tuberculous infection with apparently no ill effects. Further experiments are under way. If large packs are used, one must consider the additional compression of an exudate, which may be removed by paracentesis. WILLIAM C. BECK, M.D.

# SURGERY OF THE ABDOMEN

## THE TREATMENT OF ABDOMINAL INJURIES

### Collective Review

KARL MEYER, M.D., F.A.C.S., and PHILIP SHAPIRO, M.D., F.A.C.S., Chicago, Illinois

THE literature contains many isolated case reports of abdominal injuries: Gilbert (31), Payne (68), Hudson (39), Lee and Gallagher (45), Estes (24), and Gupta (33). Comprehensive reviews are not as common: Enderlen and Sauerbruch (23), Krabel (42), Valentine (89), and Dudley (21). In private practice the number of cases of abdominal injury is usually limited. In industrial practice this number is steadily increasing (Metz 61, Hanchett 34). In war time the pressure of work and the unfavorable circumstances under which it must be conducted, militates against thoughtful observation or improvement. It is chiefly on the service of large general hospitals in peace time that the material is adequate and the facilities for painstaking work are sufficient to encourage progress.

Instances of recovery from abdominal injuries, usually stab wounds, have been recorded since the days of Xenophon. Long ago, far-sighted surgeons recognized the facts that abdominal wounds should be opened and the viscera sutured. Oberhelman (65) quotes the advice of Jherome of Bruynswycke in 1525 to this effect. Parkes (67) quotes a prophecy of J. Marion Sims who was convinced that the mortality from operating on abdominal gunshot wounds would some day be as low as that from ovariotomy.

Before anesthesia and asepsis, surgeons in general were reluctant to accept this advice. During the Civil War, an abdominal wound was partially enlarged and some attempt at intraperitoneal hemostasis and suture was made only occasionally. The mortality was over 90 per cent. By 1900 it was decreased to 75 per cent (Farley 27). In the early years of the World War the factors of delay and poor operating conditions proved so disastrous that the operative treatment of abdominal wounds was discouraged. In the later years these factors were corrected and the mortality fell to from 50 to 60 per cent.

It is agreed in the literature that the policy of prompt laparotomy in penetrating wounds of the abdomen is definitely an American contribution. This is ascribed to the abundance of peace-time material in America, "where it is the general custom to carry firearms, and to use them on little provocation." The tendency to violence and the disregard for human life was increased further by the World War. The number of cases of bullet wound in the Cook County Hospital was abruptly doubled after the War (Oberhelman 65). With all this material, modern surgery is still woefully short of Sims' prediction. Since 1920 the mortality statistics have remained stationary. Occasional better controlled series which have been reported encourage the conviction, however, that careful preparatory and operative work, analysis of the pertinent factors, and a wider diffusion of the knowledge so gained will substantially improve the general results.

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#### PENETRATING INJURIES

It is now almost universally accepted that, with rare exceptions, all penetrating wounds of the abdomen should be operated upon as soon as possible. The exceptions include occasional small stab wounds of the lower chest, upper abdomen, or kidney regions (Vaughan 90); penetrating wounds in any region of longer than thirty-six hours' duration with the patient obviously improving; and shotgun wounds at a distance.

The first group of exceptions does not include bullet wounds; these must always be explored. In cases of small stab wounds involving the stomach it has been found that if the stomach is empty at the time of stabbing and is kept empty, and if the gastric laceration is no longer than 1 cm., the mortality of conservative treatment is so low, viz., 10 per cent, that operation is hardly worth the risk of the thoraco-abdominal approach which is usually required. If the stomach is full at the time of stabbing, or the laceration is longer, and these are much more frequently the conditions which obtain, prompt exploration and suture are demanded, for without operation the mortality is 88 per cent (Wangensteen 95).

Small, short stab wounds of the liver or kidney are better not operated upon if concomitant bowel

damage, serious internal hemorrhage, or a large flank hematoma is excluded. Even abundant hematuria does not necessarily call for surgery. Small lacerations stop bleeding spontaneously under a Scultetus binder and surgery only re-starts the bleeding. Small spleen wounds are not quite as benign. Yet without signs of hemorrhage, or the development of a "blood cake" about the spleen which can be detected by percussion and fluoroscopy, conservatism may be employed. The patient must be watched carefully, for late secondary spleen hemorrhages are dangerously common. The spleen is such a dispensable and usually easily removable organ that if doubt exists, it is better to operate even for the small stab wounds.

After thirty-six hours, a patient not showing improvement in his condition must be explored if his condition permit. After thirty-six hours, a patient showing improvement usually has neither much of a bowel perforation nor much of an internal hemorrhage. He is given nothing by mouth for from four to eight days; and the bowel is kept empty by continuous suction through a nasal tube. Morphine is given abundantly at first, not only to eliminate pain but to contract the intestinal musculature. Blood transfusions correct hemorrhage and are supportive. Hypodermoclysis is given on the first day; thereafter intravenoclysis is started cautiously and increased slowly to reduce the danger of re-starting hemorrhage from the unligated injured vessels. Enemas are interdicted. Tetanus antitoxin and anti-gas-bacillus serum are injected, and the injections are repeated in five days. The abdominal wall wounds are kept open for free drainage. Watch is kept for late abscess localization or secondary hemorrhage.

Close range shotgun wounds are almost always hopeless. Shotgun wounds sustained at a distance are better treated conservatively, as outlined above (Willis 97). It is impossible to find all of the hundreds of perforations, which are so tiny that they close spontaneously anyhow. The handling of the intestine to find all of the holes only spreads them more widely open and extrudes more feculent contaminant. Surgical trauma further decreases the peritoneal resistance. All points of entrance of the shot into the abdominal wall are surgically dressed with removal of whatever shot, wadding, or bits of clothing that can be lifted out easily. The mortality under this management, viz., 35 per cent, is better than that which can be obtained by operation (Willis 98).

With these rare and closely conditional exceptions, all penetrating wounds are operated upon as soon as possible. It must be assumed until proved otherwise that the bowel has been perforated. The absence of "shock" does not speak against this assumption. The desperate urgency of these small puncture wounds cannot be overestimated. The prognosis depends among other factors directly on the time interval between the injury and operative repair. "As soon as possible" means as soon as the patient can be brought to the hospital and can be prepared, and as soon as his condition permits operation.

The transportation problem in municipal areas is fairly well solved, but in rural areas may still be a difficult issue. Once the patient is in the hospital, no time is wasted. Rapid routine includes important points in the history, and physical examination, blood pressure, rectal temperature, blood count, urine examination, examination of the rectum for blood, and gastric aspiration. Blood is drawn for cross-matching, and the operative area is shaved. All these procedures are done while the morphine-atropine is taking effect and the patient in the Trendelenburg position is warmed under blankets with a heat cradle. Fluoroscopy, if necessary, is done on the way up to the operating room.

No patient is rushed pell-mell into the operating room. Life does not hang on minutes. A little time spent in estimating the probable injury and in improving the patient's condition will more than pay for itself in the operating room and in the final results (Baumgarten 5). In the American Surgical Hospitals during the World War, the German wounded often responded better than the Allied wounded, because they were operated upon last! Under external heat, rest, and morphine primary shock passes. Morphine-atropine not only eliminates pain, but incidentally has a fortunate effect in stopping cardiovascular disturbance from visceral irritation (Maher, Crittenden, and Shapiro 52). The blood pressure rises. A patient should scarcely ever be operated upon unless his systolic blood pressure is 80, and the outlook is brighter if it is 90 or 100. The prognosis depends directly on the patient's blood pressure at the time of operation, almost as much as it does on the time interval before operation.

The chief problem in operating on a patient in shock is not so much that of repairing the damage and getting the patient off of the table (although that too can be a serious problem), but the question of warding off peritonitis. It is no great victory to dash a patient through a frantic laparotomy, suture the intestine, and ligate vessels up and down his abdomen, only to have him struggle through three days of pain and sepsis and die of peritonitis. This is the usual sequence in a wounded patient who is operated upon when his

blood pressure is less than 80. In cases of similar wounds, if the systolic blood pressure is over 90, a good prognosis can be offered.

Loria (49) found, in general, that among patients who had had a large hemorrhage there was a mortality of 87 per cent, while among those who had had a small hemorrhage it was only 36 per cent. The blood pressure permits a better estimate of the severity of acute hemorrhage than the erythrocyte count, and is easier to follow. (An infrequent factor of error is previous hypertension). Why the patient with a low blood pressure is more likely to develop peritonitis is a matter for further study, but the fact is clear.

Spark and David (82) have shown that it is not the extravasated blood acting as a foreign body which favors the peritonitis. In all hemorrhage, leucocytosis occurs (Sommer 81). It may be that in shock there is a visceral capillary paresis which interferes with the mobilization of immune bodies and allows the fecal and environmental contamination at the time of the operation to gain a fatal, infectious foothold.

If after the primary treatment of shock with morphine, rest, and warmth, the blood pressure does not rise above 80, shock thereafter, for all practical surgical purposes, should be assumed to mean hemorrhage. That shock ordinarily meant hemorrhage was obvious to Parkes, forty years ago. Since then, neurogenic and toxemic factors have been given surgical consideration, and only recently Blalock (9) re-awakened surgeons to the exemic factor. The practical application of these controversies is important because the pernicious practice of giving intravenoclysis to patients in "shock" has developed. Every medical student learns that the first requirement in controlling hemorrhage is to "stop the bleeder." He learns that the drop in blood pressure is one of the factors favoring the spontaneous arrest of hemorrhage. Yet only with difficulty can he be dissuaded from hurriedly starting an intravenoclysis on a patient in "shock," raising his blood pressure, starting up the hemorrhage again, and washing out whatever blood the patient still has in his vessels with salt solution. Vital tissues cannot be oxygenated with salt solution. The procedure is an indirect variation of the practice during the Crimean War, of bleeding patients who were bleeding in order to stop their hemorrhage.

Since shock is hemorrhage, the treatment for shock is blood transfusion. The quantity of blood usually given, up to 500 c.cm., does not re-start bleeding partly because blood transfusion is at the same time a hemostatic maneuver. Only during the transfusion of the second 500 c.cm. does the blood pressure rise so high as occasionally to overcome this factor and re-start bleeding. Even then, if some blood be lost, it is being replaced by a greater quantity of almost equally good blood, and not by salt or glucose solutions. Acacia solutions are not recommended because of the severe degenerative changes in the liver (Studdiford 84). Hypodermoclysis might be allowed as an idle deposit of fluids which will be available when the blood pressure improves after operation, but it is not a significant maneuver. Intravenoclysis is forbidden. The main reliance is placed on blood transfusion.

The institution of the "blood bank" at the Cook County Hospital will be, it is hoped, an important factor in reducing mortality. Blood from all available donors is typed, checked by the Kahn reaction, and stored. Cross-matching takes but a few minutes. An emergency supply of blood is always available. If after one transfusion, the blood pressure rises to 90 or 100, operation is started at once. If it rises barely to 80 or less, or does not rise at all, transfusion of a second 500 c.cm. of blood is started, and the operation begun. A pressure remaining at much below 80 or slowly falling demands immediate operation, but operation must be then regarded as one of despair, a measure of last resort.

General anesthesia is usually employed to secure complete relaxation and to allow rapid work. Spinal anesthesia is not used because it lowers the blood pressure. Local anesthesia may suffice for at least the early exploration of many stab wounds and of occasional bullet wounds which are tangential to the peritoneal cavity. Suspicious stab wounds may be followed under local anesthesia until it is determined how deeply they have gone and how much damage has been done. If intraperitoneal repairs are necessary, they may have to be completed under general anesthesia. Even massive eviscerations from large stab wounds can often be repaired under local anesthesia, with the possible necessity of general anesthesia for a few minutes while the viscera are being replaced.

The prognosis of stab wounds is not as bad as that of bullet wounds according to Martin (54). The average mortality from stab wounds is 26 per cent as compared with 60 per cent for bullet wounds. Even the huge eviscerations often present surprisingly little shock and uneventful recoveries (Thomas 86, Revelli 73). The bowel perforations are usually small and but little traumatized. There is no explosive spattering and "seeding" of feculent material as in bullet wounds. The repaired bowel is washed clean of street dirt and other contamination with large quan-

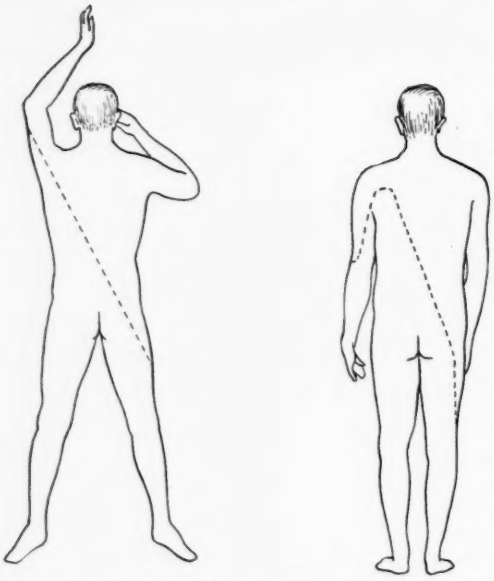


Fig. 1. Left. Course of bullet at time of wound infliction when patient was in typical prone rifle position. Right. Apparently bizarre course of bullet when patient is on examining or operating table.[1]

tities of warm sterile saline solution, and returned to the peritoneal cavity. The worst source of infection in some of these cases is not spilled bowel content but the bacteria carried in on the knife blade from the assailant's practice of "spitting" on the blade before plunging it in. Fatal peritonitis may ensue from this source alone without any bowel opening. The best medium for such infection is the abdominal wall fat which then drains into the peritoneal cavity. Even late, sudden deaths may occur from rupture of such abscesses into the peritoneum. For these reasons, even small penetrating stab wounds must be explored and the peritoneal opening closed tightly, without drainage. The abdominal wall tissues, however, are either drained or else left unclosed or closed only loosely with interrupted sutures to insure drainage outward.

Bullet wounds are more serious and difficult. Repair is considerably facilitated, however, by a pre-operative determination of the probable course of the bullet. It is a common delusion that bullets take curved and bizarre courses through the body. This is a fantasy inherited from the days before exploration and the x-ray, and fostered by insufficient analysis of the circumstances of the shooting (Figure 1).

Bullets take a straight line. If one bullet struck the patient, a straight line between the wounds of entrance and exit will mark every viscus injured unless the viscera have shifted since the shooting. With the patient lying supine on the operating table, the liver, stomach, and other viscera are in somewhat different relation to the abdominal wall wounds than when he received the wound. He was then probably erect or prone. The small intestine may move considerably afterward. Narrow tubular structures, like larger arteries and to a less extent veins and the ureter, have somewhat of a capacity of slipping aside from the path of an oncoming bullet, because of the pressure alterations set up in front of rapidly moving missiles. Lungs are often perforated clean through without producing any symptoms. With correction made for factors such as these, the straight line rule can be demonstrated in almost every case (Figure 2).

If a bullet has enough force to go through skin, it will not be deflected by soft parts. Ribs are fractured by bullets or stop them, but do not deflect them. Vertebral bodies frequently stop bullets, even if they are struck tangentially. If the bullet passes by at all, it is deflected only rarely, and re-starts a straight course from that point on. Another possible exception is the case in which a bullet has just managed to get through the skin and into the peritoneal cavity, and then drops free in the pelvis. (R. T. Vaughn, 90.) Isolated instances of bullets falling to rest inside the intestine, or working their way into large vessels and being transported widely have been reported but are too rare to disturb the rule (Oberhelman and Le Count 65, Simon 79).

If there is no wound of exit, the bullet can sometimes be found by passing the hand firmly over the skin of the opposite side of the body. The skin acts as a leather shield, and can alone stop bullets which are almost spent. If the bullet still cannot be found, fluoroscopy should be done to locate it, and is well worth the time. A straight line between the bullet and the wound of entrance will mark out the path of damage. Multiple bullets complicate the picture, but still allow of preoperative alignment.

The incision is planned on the basis of this alignment so that the viscera involved may be reached most easily. Generous incisions are required. The more experience a surgeon has had in abdominal injuries, the longer are his incisions. Transverse or oblique incisions are sometimes suitable. Paramedian incisions with L-shaped or

[1]From Lillienthal's Thoracic Surgery, p. 528. Philadelphia: W. B. Saunders Company, 1926.

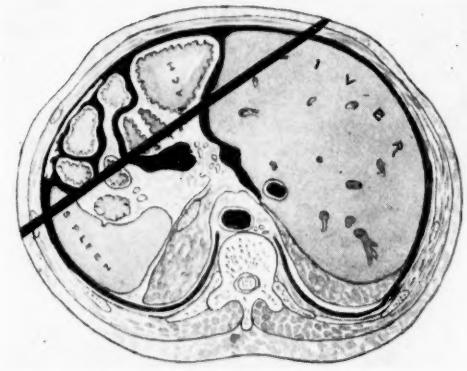
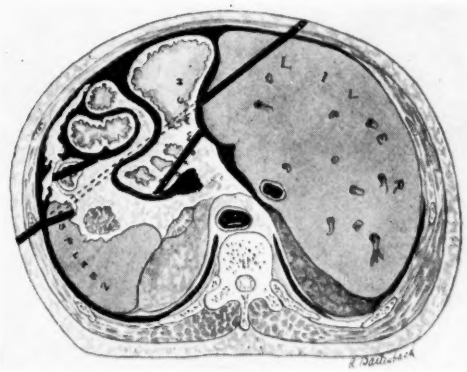



Fig. 2. Left. Bullets take a straight line. Cross section of body midway between xiphoid process and umbilicus. Solid and hollow viscera and abdominal wall in positions they occupy as patient is standing or sitting as at time of assault. Path of bullet is straight.




Right. Patient lying on operating or examining table. Solid and hollow viscera and abdominal wall have shifted from their previous relative positions so that the bullet is now apparently erratic. These broken lines can be aligned during exploration into a straight trajectory.

T-shaped transverse extensions give the best access. For the most rapid work, the intestine is at once eviscerated into warm wet towels, the perforations of the bowel and mesentery located and closed, and the whole mass returned. If speed is not so urgent, a somewhat gentler technique is to "run the bowel" in segments, and return each as its repair is completed. In Le Count's autoptic series, overlooked perforations were found in one-half of the patients who died. The overlooked perforations may not have been the entire cause of death. Meticulous operating to avoid overlooking a perforation may carry enough extra surgical trauma to balance the scales against careful search (Billings 7). The burden of responsibility, however, lies on the surgeon who has overlooked holes.

The chief practical value of the straight-line rule is that when the repaired viscera are replaced, the bullet track can be reproduced. When every gap in the line is filled, the surgeon can rest assured that he has found and corrected every perforation. He need waste no further time in re-checking. Retroperitoneal bowel wounds especially are not missed if the rule is followed. Perforations are closed as quickly and simply as possible (Mauro 56). A cross suture of catgut through all layers secures rapid closure and hemostasis. A Lembert or mattress suture of silk or linen is used for peritonealization. Bowel-wall hemostasis is important. Especially in the stomach fatal secondary hemorrhage can occur from a submucosal vessel missed by a simple serosal suture. The sutures should not be pulled too tightly. Fine suture material gives stronger unions than coarse. Vessel walls and bowel surfaces need only bare contact for the best healing.

Multiple adjacent perforations are managed better by resection of the involved segment and end-to-end anastomosis. Cases requiring resection carry a higher mortality than those requiring only closure of the perforations. The mesenteric angle is carefully closed by a single or double Monsell suture. The remainder of the anastomosis, however, can be done quickly by a continuous glover or lock suture, or by interrupted simple or mattress sutures reinforced by Lembert peritonealization. Any tendency to constriction can be corrected by oblique resection or by enlarging the stoma with a longitudinal incision along the antimesenteric border. Tangential bullet "grazes" of the intestine are closed over by transverse infolding to prevent late perforation.

Mesenteric ecchymoses if small can be disregarded. They are due to rupture of tiny veins from the explosive effect of the bullet. Larger ecchymoses or perforations must be opened, and the injured vessels isolated and ligated. Rarely is additional bowel resection required because of vessel damage. The collateral supply is abundant through the numerous arcades. The mesentery can be stripped off for 3 inches of the ileum in animals and the bowel still remain viable. Further away from the intestine, the marginal artery and the numerous arcades readily replace one another. In the presence of mesenteric injury, if the corresponding bowel presents no color changes, nothing need be feared. If viability be threatened, some pallor or cyanosis will at once be evident and will set the indication for resection.

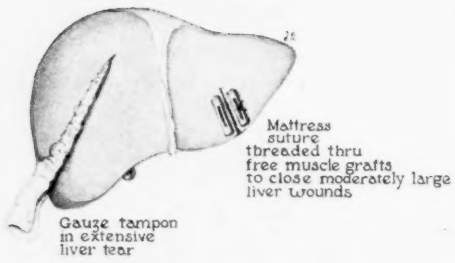



Fig. 3. Methods of controlling extensive and moderately large liver wounds. The tampon is a method of extremis. The free muscle grafts cushion the suture and furnish thrombokinase for hemostasis; a third piece of muscle may be inserted in the wound cleft. Small wounds may be sutured simply, or disregarded.

Bullet wounds of the liver usually shatter at least a portion of it and are not only immediately serious but may lead to biliary peritonitis, liver necroses and abscesses, portal vein thrombosis, and pulmonary emboli (McGowan 58). Small to moderate sized wounds are closed best with mattress sutures of catgut threaded through pieces of muscle excised from the abdominal wall. The muscle grafts cushion the sutures and prevent their tearing out, and furnish abundant thrombokinase to promote hemostasis. Both surfaces of the liver must be repaired. In the presence of high wounds under the dome of the diaphragm, difficult to approach, it has been suggested that the liver be sutured to the diaphragm. In large wounds of the liver, or in wounds difficult of access, or when the patient is in poor condition, the liver wound is packed with gauze tampons which act secondarily as drains. A Scultetus binder compresses the liver firmly against the pack and stops the hemorrhage (Meyer 62) (Figure 3).

Spleen wounds of any but trifling character are most safely treated by splenectomy. Abscess, necrosis, and secondary hemorrhage are too dangerous to permit conservative management. Wounds of the pancreas are sutured if possible, or tamponed, but are always drained to limit pancreatic-juice necrosis.

If the urinary bladder is perforated, the holes are closed by a catgut suture in two layers. Nonabsorbable suture is not used because of its tendency to migrate into the lumen and act as a nucleus for stone formation (Mathews 55). The bladder must be kept empty for six or seven days by an indwelling catheter. If urethral strictures make catheterization difficult, suprapubic drainage is employed. A "cigarette drain" is also inserted into the space of Retzius, since it has usually been opened by the entrance or exit of the bullet. The ureter is rarely damaged, but can be repaired over a ureteral catheter, or be implanted into the colon. Kidney perforations are not uncommon. They can usually be handled conservatively unless the kidney is too badly shattered, or unless the renal pelvis or vessels are irreparably damaged. Kidney suture is best accomplished by the free muscle transplant method. If the patient is in poor condition from concomitant injuries, secondary hemorrhage cannot be risked by indulging in plastic operations, and nephrectomy is safer (Herrmann 35).

Large vessel wounds usually prove fatal before admission of the patient to the hospital, but occasionally lend themselves to surgery. The prognosis is poor also because internal hemorrhage has usually been severe and the patients succumb to peritonitis even when contamination has been slight. The extravasated blood is rarely used for re-infusion because of contamination. The larger veins and medium-sized arteries can safely be ligated doubly and divided. The technique of vessel repair is not difficult provided the vessel is temporarily occluded by provisional compression above and below the wound. Continuous fine silk in a fine non-cutting needle closes the defect, which can be further re-inforced by a pedicled muscle graft (McNealy and Shapiro 59) (Figure 4).

Perineal impalings, criminal abortions, or pneumatic ruptures of the sigmoid in industry may also be responsible for intra-abdominal injuries (Lejar 46). Bullet wounds of the thigh may be directed toward and into the peritoneal cavity. The same principles apply, except that presacral cellulitis and perineal or gluteal abscesses and fistulas may result.

Wounds of the thorax may give a pseudoperitoneal reaction, but if the abdomen is actually penetrated the mortality is higher than that of thoracic or abdominal wounds alone, ranging from 76 to 92 per cent (Wilson 99, Simon 80). Operative repair of a shattered lung or liver is often impossible. Shock from severe abdominal injury increases the reduction in vital capacity caused by the chest wound. Therefore, a positive pressure apparatus, no matter how simple, should always be available when operation is done in cases of this type.

Half of the ribs cover the abdomen. In penetrating wounds below the fifth rib, and even in higher wounds which are directed downward, abdominal injury must be considered. Similarly, a stab wound of the epigastric notch may perforate the stomach and diaphragm, and end in the

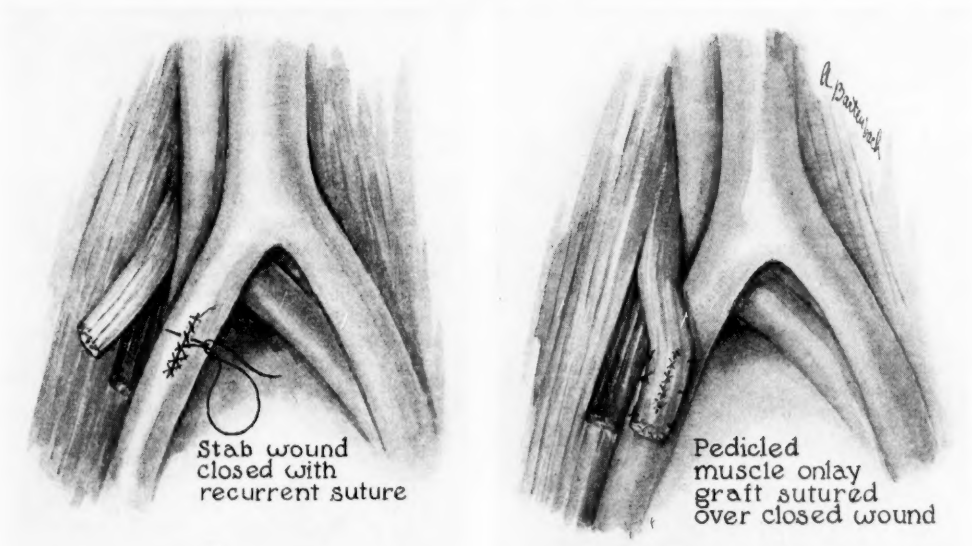



Fig. 4. Left. Continuous recurrent suture of fine silk in stab wound of iliac artery. The vessel must be controlled during repair by proximal and distal provisional hemostasis by the sling-tape, bulldog clamp, or Spivack clamp methods. Right. Graft from psoas muscle raised and sutured to the vessel to buttress the arterial repair.

lung or heart (Mayer 57). The usual policy in penetrating wounds of the chest is conservative management except on specific complication, but if abdominal penetration is suspected, exploration is required (Just 41). The approach depends on the predominant injury. In stab wounds, it is usually made through the chest. Small wounds of the stomach or colon may sometimes be repaired through the tear in the diaphragm. The diaphragm is then closed to prevent hernia. If the abdominal injury is more extensive, an abdominal approach is added. In bullet wounds, the predominant injury is likely to be abdominal and the latter approach is preferred with extension to the thorax if necessary. Temporary phrenic paralysis by crushing may be used to assist diaphragmatic healing if the patient's condition justifies the procedure (Nierstrasz 64). In abdominopericardiac wounds in the epigastric notch, the pericardial sac may be drained internally into the peritoneum through the diaphragmatic opening rather than by means of an additional opening into the pleura. This prevents recurrence of the tamponade, and still avoids external drainage. Either the peritoneum or the pleura can take care of the effusion much better than the pericardium.

The bullet holes in the abdominal wall, if severely traumatized, are excised. Otherwise they are dressed surgically, and the peritoneal wounds of entrance and exit are closed from the inside to prevent drainage of the abdominal wall into the peritoneal cavity. The bullet is removed if it is easily accessible; otherwise it is disregarded. The abdominal incision may be closed by through-and-through suture if speed is urgent, but it usually can be closed in layers. Since wound contamination and infection are common, interrupted sutures are required, and small rubber dam drains are inserted to, but not into the peritoneal cavity. Wound infection is carefully watched for and promptly drained. If it is not, it can be as troublesome and disastrous as primary peritonitis, or it may rupture inward and cause late secondary peritonitis and even sudden death. Even if neglected wound infections are finally controlled, eviscerations are more frequent and postoperative hernias from loss of fascial structures by suppuration are common (Du Bourquet 20, Jenkins 40).

The question of managing intra-abdominal soiling is a major problem since peritonitis causes 34 per cent of all the deaths. Controversies attend every procedure suggested, but general tendencies are crystallizing (Ghose 30). It is known that gastric spillage carries the smallest threat of peritonitis. Duodenal spillage is fairly benign unless the retroperitoneal spaces are implicated. Urine

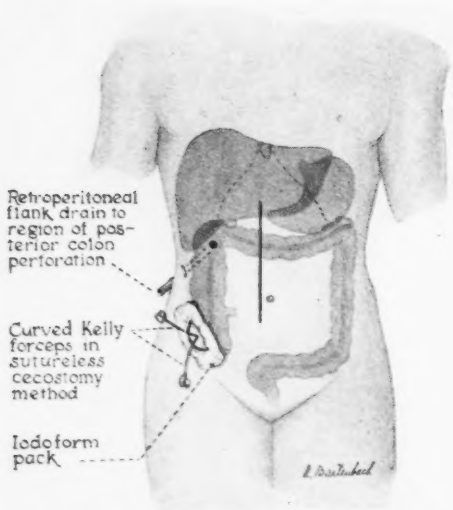

Retroperitoneal flank drain to region of posterior colon perforation
Curved Kelly forceps in sutureless cecostomy method
Iodoform pack

Fig. 5. Principal drainage methods used. Penrose drain to retroperitoneal tissues. Cecostomy to secure low intestinal decompression and intraluminal drainage. Incision is drained to, but not into the peritoneum.

spillage if caught early is benign. The further down the small intestine perforations are found the more serious is the soiling. The danger of peritonitis from injury of the small intestine, however, is much less than that from the colon. Bullets which enter the colon from front to back may splatter feces into the retroperitoneal tissues. It is even worse when bullets enter from the back, and splatter contamination into the general peritoneal cavity. Worst of all with regard to the danger of peritonitis is the side-to-side bullet wound.

In closing colon wounds, retroperitoneal tissues are often exposed. Drains are inserted through the flank whenever these tissues are exposed because they cannot take care of infection as well as the peritoneum. These drains are removed in stages after four days. The peritoneal cavity is not lavaged, since this only spreads contaminant, and is not traumatized by chemical antiseptics (Gay 28). The general peritoneum is not drained, because a drain does not supply whatever ability it may lack to take care of itself (Borchard and Schmieden 10). Drains are promptly walled off anyhow. They aggravate the spread of infection, encourage the formation of adhesions, prolong healing, predispose to hernia and increase chances of formation of fecal fistulas (Binkley and Cole 8). Only abdominal wall tissues are drained.

When the peritonitis danger is greatest, i.e., in low wounds of the ileum, but especially in wounds of the colon, proximal ostomy is recommended to secure low intra-intestinal drainage at once. This anticipates ileus and prevents tension on the bowel sutures. For low wounds of the ileum, a Witzel type of ostomy is usually used. If the bullet goes through the cecum, the hole itself can be used as the stoma. A spur colostomy of any proximal part of the colon to deflect the fecal current completely is sometimes required, especially when rectal or sigmoidal lacerations are extensive or have not been closed securely. Usually, only a wide ventilation colostomy is all that is required. This is best accomplished by hanging a small portion of the wall of the colon out on the abdominal surface by means of two clamps. After twelve hours, enough adhesion has formed to permit gradual opening of the stoma. Under twelve hours, not enough intestinal gas to necessitate opening accumulates. This clamp method is superior to the suture method of fixing the stoma because of the troublesome abscess pockets and secondary multiple fistulas which sometimes develop after the latter technique. When the ventilation colostomy, preferably a cecostomy through a McBurney incision, has served its purpose, it either closes spontaneously or can easily be closed surgically (Turner 88) (Figure 5).

An auxiliary or an alternative to colostomy which is recommended is dilatation of the anal sphincter at the end of the operation either by stretching or by division at the posterior commissure. A large rubber tube is then sutured in. This is effective for the prevention of colon distention provided peristalses are sufficiently active to carry gas down to the rectum, and provided the tube does not become plugged by fecal masses. The sphincter gradually heals, and spontaneously recovers its tonus in from seven to twelve days. This procedure is not as efficient as colostomy, but is simpler.

Chemical and immunological attempts to combat peritonitis have so far been disappointing (Wangensteen 95). Most recently, bacillus coli bactragen has been injected intraperitoneally in early cases, and sulfanilamide preparations have been pushed in an effort to increase resistance. They have been tried on too few cases as yet to warrant comment. Tetanus antitoxin and gas-bacillus serum are given routinely.

The postoperative care of abdominal injuries demands close supervision. It follows the routine described except that intravenoclysis is given freely. Multiple blood transfusions are of great value. Localization of intra-abdominal abscesses

is watched for, but requires drainage only after definite pointing abdominally or rectally. Ileus usually yields to conservative treatment. In all cases tenacity is essential. Many an apparently hopeless situation has been saved by watchfulness and by persistent, intense after-care.

The final prognosis rests on many factors but chiefly on the amount of hemorrhage, the time elapsing before operation, the condition of the patient at the time of operation, the severity and multiplicity of the viscera damaged, the surgical skill applied, and the after-care (McQuire, 60). If patients are operated upon within six hours the mortality is 37 per cent, if between six and twelve hours it is 64 per cent, if between twelve and sixteen hours it is 84 per cent, and operation after this time saves only a few lives (Counsellor 14). Speed is important, yet if enough time has been taken for proper pre-operative diagnostic alignment and preparation, the average mortality has dropped in special series from 63 to 30 per cent.

The caliber, velocity, and jacketing of the bullet are important. Number 22's are relatively benign, number 38's and 45's have a terrific traumatizing and explosive effect so that resections are often required and recovery is rare (Loria 50). Occasionally a perforating abdominal wound may strike no viscus or large vessels. In these cases the patients usually recover, but there is still some danger from infection carried in by the missile. The average number of bowel perforations found is 5.7. If a single viscus has been struck the mortality is 34 per cent. If this single viscus is solid, the mortality is 13 per cent, and if hollow 42 per cent. Gastric, jejunal, or urinary-bladder perforations alone are relatively not serious, but the severity varies according to whether the viscera are empty or full at the time of shooting. Ileal perforations have a mortality of 48.7 per cent. Perforations of the colon have a mortality of 85 per cent, and give the greatest concern. Unfortunately, quite often more than one viscus is damaged. The same relations hold, but when two or more viscera have been struck, or when two or more missiles have penetrated, the mortality averages 80.7 per cent (Oberhelman and Le Count 65).

Rapid and skillful operating is essential. The patients who recover are usually those who required less than one hour of surgery, while those who die are those who required more than one hour. This is partly due to the more extensive injuries in the latter group. That skill and experience are also factors is indicated by Le Count's statistics at the Cook County Hospital. The mortality of the operations performed by the 2 surgical wardens who have had an abundant experience in the field was 57.6 per cent, while that of a comparable number of operations performed by 35 other surgeons combined was 69 per cent.

There will always be some irreducible minimum of mortality because of overwhelming trauma, previous general or local disease, and severe coincidental injuries. Yet series with a 30 per cent mortality have been reported (Prey 71). It is not too much to hope that with prompt action, collected judgment of risk, careful preparation, facile operating, and painstaking after-care, the mortality of penetrating wounds will some day be dropped to this level.

### CLOSED WOUNDS

Diagnosis is the chief problem in closed wounds of the abdomen, as speed balanced by proper preparation is the chief problem in penetrating wounds. The surgery of closed wounds has been named aptly, "The Management of Abdominal Mysteries" (Allman 2). Although the implication is a trifle exaggerated, it expresses the quandary of the attending surgeon, the dilemma of operative indication, the frequency of unanswered problems, the bizarre findings, and late disasters (Malone 53, Thomson 87, Scholl 76). There is a note of uncertainty and impatience in the numerous reports of pseudoperitoneal syndromes forcing unnecessary and dangerous operations, of acutely serious and completely overlooked hidden lesions not operated upon, of delayed bowel necroses and rupture, of fatal secondary hemorrhages, abscesses, and cysts, and of disabling sequelæ including bowel stenoses, ulcers, adhesions, and hernias (Fairchild 26, Reid 72, Dean 18, Averbuck 3, Schorre 77).

Laparotomy cannot be undertaken lightly when so often there is so little which needs to be, or can be repaired (Robertson 74). The surgeon must answer with accomplishment for the superimposed risks of postoperative infections and hernias, pulmonary complications, surgical trauma, re-awakened hemorrhage, anesthetic insult, and the dangers from previous debilitating disease. Procrastination because of faulty diagnosis can, however, be even more disastrous.

"Peritonism" or "traumatic peritonitis" is a frequent syndrome (Eliason 22, Oppenheimer 66). There are sudden board-like rigidity of the abdomen, diffuse tenderness, and absence of peristaltic sounds. These are combined with the rapid pulse, labored respiration, pallor, anxiety, and the low blood pressure of primary shock. The clinical picture would be considered typical of severe visceral damage and internal hemorrhage. Yet all these findings can be produced either by blunt shock to the celiac plexus with no visceral damage

whatsoever, or by injuries to the back or thorax with referred abdominal signs. They can all be produced by injury to the abdominal wall alone, or by retroperitoneal hemorrhages, by small omental and mesenteric injuries, or by small lacerations of the solid viscera. The necessity for immediate operation seems obvious, yet in an hour or so under primary shock treatment, the abdominal sounds re-appear, rigidity lessens, tenderness subsides, the shock picture vanishes, and no need for operation remains. About 70 per cent of all closed injuries are of such character that laparotomy is needless, or fruitless (Hinton 36).

When laparotomy is required its necessity is often not apparent, or is overlooked, and fatal delay ensues. Because of appalling experiences of this kind it is held better to open a suspected peritoneal cavity occasionally and find no lesion demanding surgical repair, than to procrastinate until hemorrhage or peritonitis are beyond surgical recall (deTarnowsky 19). About one-fourth of the closed wounds involve hollow viscera, and these must always be operated upon. Large tears of the liver require suture or tamponade. Severe crushing injuries of the kidney sometimes require suture, packing, or nephrectomy. Spleen injuries must usually be treated surgically. The spleen hung on a loose pedicle has an inelastic thin capsule and a pultaceous substance which does not favor spontaneous hemostasis. Even with temporary arrest of the bleeding, secondary hemorrhages develop sometimes as long as one month afterward.

The decision to operate rests on the diagnosis of injury of the hollow viscera or of serious internal hemorrhage. Shock treatment is instituted. This includes external heat, morphine, rest, the Trendelenburg position, blood transfusion, and subcutaneous fluids. If the pulse and blood pressure improve, abdominal signs diminish, flatus and urine are passed, and fluoroscopy shows no free gas bubble, operation is withheld. Careful supervision is continued (Davis 17).

The erythrocyte count is chiefly of sequential value but an early leucocytosis denotes internal hemorrhage and helps distinguish serious cases from primary shock, hysteria, or malingering. The findings from gastric aspiration are inspected for blood from possible injury of the upper bowel. Rectal examination checks pelvic peritoneal irritation from blood or spilled content of the hollow viscera, and blood found on the examining finger indicates injury of the lower bowel. Blood-free urine excludes injury of the bladder or kidney. If urine cannot be passed catheterization may yield clear urine or reveal an empty bladder. If the bladder be found empty, air can be injected through the catheter (Vaughan and Rudnick 91). The subsequent detection of gas under the diaphragm establishes the diagnosis of intraperitoneal rupture of the bladder, and local emphysema indicates extraperitoneal rupture.

A negative finding in fluoroscopy is not entirely reliable in excluding intestinal injury. If the stomach or cecum is ruptured when it contains air, a free gas bubble will appear in most cases (Vaughan and Singer 92). In doubtful cases air may be added with the stomach or colon tube. Duodenal rupture may also show retroperitoneal emphysema. The jejunum and ileum, however, are normally empty. It would take twelve hours for gas to accumulate from developing peritonitic ileus before enough escaped to be seen under the fluoroscope. Cases of ruptured intestine operated upon after twelve hours terminate fatally in almost 100 per cent (Sherman 78). The diagnosis must be established long before this by persistent signs of peritoneal irritation.

After shock treatment is applied, the blood pressure may rise to 80 or over, but abdominal rigidity, tenderness, and silence persist. The white count is elevated. Distention may begin or flank dullness appear. Fluoroscopy may show a free gas bubble. Blood may be found in the gastric content, stool, or urine. Laparotomy is then required, and should be done promptly. The average time from injury to operation in the patients who lived was one hour and fifty-three minutes; in those who died it was two hours and fifty-three minutes (Brady 11).

After treatment of shock with one or two transfusions the blood pressure may still be low, but signs of a ruptured hollow viscus, peritoneal irritation, or increasing internal hemorrhage persist. Laparotomy is demanded but must be regarded as a desperate risk which has to be faced. Despite an occasional unnecessary operation, since careful, selective diagnosis and preparation followed by prompt operation has been practiced in the management of closed wounds of the abdomen, the mortality has dropped from 70 per cent to its present level of 30 per cent.

If laparotomy is performed, the same principles apply as in penetrating wounds. Fifty-eight per cent of the ruptures of the small intestine occur in the first three feet of jejunum and last three feet of ileum, where these loops are compressed against the vertebral column. This is therefore the first place to look (Butler 12, Wilensky 96). The ileum within an inguinal hernia is a frequent site of rupture from external closed trauma. The stomach is occasionally burst by crushing injuries, especially

when it is full of food, or is diseased. The colon is injured by blunt trauma only rarely (Landon 44), but even the rectum has been burst in closed trauma by sudden compression of the colon gases against a fecal plug (Butler 13, Wagner 93).

In crushing injuries of the bowel, the mucosa is damaged worse than the serosa. In bursting injuries, the serosa is damaged more than the mucosa (Davis 16). Perforation may not take place at once. Slow necrosis and secondary infection of the bowel wall lead to delayed, unexpected, and often fatal rupture. Questionable areas on the serosa in crushing injuries should therefore be inverted widely, or resected. Late stenoses, diverticula, or adhesions result from a similar, milder process of slow necrosis (Bainbridge 4). Rarely, a mesenteric hematoma gradually extends until late mesenteric thrombosis leads to gangrene (Hogg 37).

Delayed sequelæ of injuries of the liver include sequestration, abscess, thrombosis of the portal vein, and pulmonary emboli (Robin 75, Philipowicz 70, Peter 69). Pancreatic injuries do not produce true diabetes mellitus, but may result in pseudocysts (Stevenson 83). Unoperated injuries of the kidney rarely give further trouble; injuries of the spleen often do (Allen 1, Lewis 47). Internal hernias may result from small mesenteric rents or from loops of adhesions. Diaphragmatic hernias and ventral hernias from unoperated closed traumas of the abdomen are common (Hook 38, Benkovich 6, Kummer 43).

There is considerable concern in the literature about the medicolegal aspects of late traumatic peptic ulcer (Witherspoon 100, Gerendasy 29, Gray 32, Morrow 63, Magnus 51, Eusterman 25, Liniger and Molineus 48, Crohn 15). Liniger and Molineus have set forth criteria by which it may be determined that a peptic ulcer is of traumatic origin, as follows:

1. Proof of the absence of a gastroduodenal lesion before the accident.
2. Severe trauma localized to the epigastrium.
3. The immediate onset of the symptoms.
4. A clinical course similar to that of ordinary peptic ulcer.

With these varied and clouded pictures, the first diagnosis must not be assumed to close the case. Especially, the cases which are not operated upon must be resurveyed several times a day in the beginning, and twice daily after forty-eight hours. No patient should be discharged while he complains of abdominal symptoms (Susman 85). Both the surgically and the non-surgically treated cases are followed until long afterward to detect and correct the numerous possible late sequelæ.

## CONCLUSIONS

1. The policy of prompt exploration in penetrating wounds of the abdomen is established.
2. However, no patient should be subjected to laparotomy until proper preparation has brought his blood pressure above 80, unless the operation is one of "last resort."
3. Secondary shock on a surgical service is equivalent to hemorrhage, and until the bleeding vessels are ligated should not be treated by intravenoclysis but by blood transfusion.
4. Patients operated upon in shock are not only less likely to survive the operative trauma, but are almost certain to succumb to peritonitis eventually. Correction of shock increases the resistance to peritonitis.
5. Stab wounds are not as serious as bullet wounds even when eviscerations are produced.
6. Shot-gun wounds at close range are usually immediately fatal. Shot-gun wounds at a distance are best managed by conservative management without operation.
7. Bullets do not take erratic courses within the abdomen but practically always follow a straight line. Following, and filling in this straight line is one of the best assurances that no perforations have been overlooked.
8. Free muscle grafts assist in hemostasis of the liver or kidney. In massive injuries of the liver tamponade is safer; in those of the kidney nephrectomy may be required. For even moderate wounds of the spleen, splenectomy is safer because of the danger of late hemorrhage.
9. Pedicled-muscle onlay grafts assist in the repair of large vessels.
10. Bowel perforations are closed with the simplest technique which will give hemostasis and peritonealization. Resections are avoided if possible, but may be required by multiple adjacent perforations or by impairment of the bowel viability.
11. For colon perforations, proximal ventilation or deflection colostomy is recommended.
12. Perforations of the urinary bladder are closed by catgut suture to avoid secondary stones. The bladder must be kept decompressed.
13. The general peritoneal cavity is not lavaged and is not drained. Retroperitoneal tissues if exposed are drained. The abdominal incision is drained also.
14. Anti-gas-bacillus serum and tetanus antitoxin are given routinely.
15. Postoperative transfusions, intravenous glucose and saline solutions, constant suction by

means of the nasal tube, adequate morphine, and good nursing care are essential. Apparently hopeless situations may be saved by conscientious, tenacious after-care.

16. The prognosis depends chiefly on the amount of hemorrhage, the condition of the patient at operation, the severity of the visceral damage, the time elapsing until operation, the surgical experience, and the after-care.
17. In closed wounds of the abdomen the chief problem is diagnosis, but speed and proper preparation are also important.
18. Conservatism is in general the best policy because 70 per cent of the patients have pseudoperitoneal syndromes or injuries which either do not require laparotomy, or cannot be benefited by it.
19. Shock treatment is started, however, and laparotomy is performed if signs of peritoneal irritation persist, internal hemorrhage does not stop, or special tests reveal probable injury of a hollow viscus. The absence of a gas bubble does not exclude the possibility of rupture of the small intestine and suspected cases are operated upon in preference to risking fatal delay.
20. Careful supervision is continued, especially in those patients not operated upon because of the frequency of late sequelæ.

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## ABDOMINAL WALL AND PERITONEUM

**Fallis, L. S.: Recurrent Inguinal Hernia.** *Ann. Surg.*, 1937, 106: 363.

The author reviews 200 operations for recurrent inguinal hernia performed at the Henry Ford Hospital during the fifteen-year period from 1920 to 1934 inclusive. There were 26 operative failures and a rate of recurrence of 13 per cent. Seventy-eight per cent of the recurrences occurred between the ages of thirty and fifty. There were 3 females in the series, a percentage of 1.5. Ten of the patients, or 5 per cent of the series, were recorded as being overweight. Ninety-two per cent of the patients in this series had occupations which entailed heavy lifting and straining; while only 8 per cent of the recurrences were in patients whose occupations were sedentary in character. Seventy-one of the patients, or 35.5 per cent of the series, gave a definite history of injury preceding the appearance of the recurrence. Seventy-seven and five-tenths per cent of the recurrences took place more than six months after the operation, and in 52 per cent of the patients there was no evidence of recurrence until more than three years had elapsed. Twenty-six and five-tenths per cent, or more than one-quarter of the patients, were operated upon within one month of the recurrence of their hernia, and 66.5 per cent, or two-thirds of the group, before a year had elapsed. The author in a previous series of 1,600 primary hernia operations, noted that 57.6 per cent of the recurrences were on the left side and only 42.4 per cent on the right side. Thirty-eight and five-tenths per cent of recurrent hernia operations were performed under spinal anesthesia. The spermatic cord was found to have been transplanted in 40 patients, or 20 per cent of the series. There was almost an equal number of direct and indirect recurrences in this series, i.e., 99 direct and 101 indirect. Of the 53 recurrences in patients originally operated upon at this hospital, there were 38, or 71.7 per cent, of this group who had direct recurrence and 15, or 28.3 per cent, of the group who had indirect recurrences, while of the 147 recurrences in patients in whom the first operation had been performed elsewhere, 61, or 41.5 per cent, had indirect recurrences. In 18 cases, or 9 per cent, there was no sac found at operation. There were 11 cases of sliding hernia, a percentage of 5.5. The importance of the transversalis fascia is stressed.

ELLA M. SALMONSEN.

**Fowler, S. W.: The Status of Research on the Injection Treatment of Hernia.** *Am. J. Surg.*, 1937, 37: 403.

After a careful perusal of the literature on the subject of the injection treatment of hernia, the author notes many points that need to be studied, and warns against the unnecessary repetition of work which has been satisfactorily done previously. Future profitable studies, he believes, lie in the fields of biopsies, necropsies, and follow-up and statistical studies of sequelæ and end-results.

If a hernia cannot be reduced, or if it cannot be controlled when reduced, it cannot be treated by the injection method. The presence of a fat pad in the sacs of femoral, umbilical, or epigastric hernia causes pain when a truss is applied. Such cases should not be treated until this condition has been relieved. Undescended testicle on the involved side is a contra-indication to injection. Hyperthyroidism and hemophilia are also mentioned as contra-indications. Cardiac conditions or diabetes do not contra-indicate the injection treatment of hernia, but diabetes retards repair, as do anemia, extreme age, flabby, or very spare musculature. The author states that, with the exception of sliding hernias, all of the accessible abdominal hernias, including incisional hernias, have been successfully treated.

The most frequent complication of the injection treatment is an acute inflammatory reaction due to overdosage. A few hydroceles which soon subsided have been observed. Intraperitoneal injection of the irritant is indicated by immediate cramps in the patient, and more or less shock; however, the author believes that no permanent harm can result from this accident. He states that a sterility or impotency resulting from the treatment has not been authenticated.

During such treatment the hernia must be kept continuously reduced, and the truss may have to be worn both day and night at first. The author prefers more injections of a mild growth-producing (auxetic) substance rather than a few injections of a strong irritant. He believes that the end-results obtained

by Bratrud—only 9 incomplete closures in 707 cases —are attainable by the injection treatment.

EARL O. LATIMER, M.D.

**Burdick, C. G., and Coley, B. L.: The Injection Method of Treating Hernia.** *Ann. Surg.*, 1937, 106: 322.

In order to know from first-hand information the advantages, disadvantages, and end-results of the injection method for the treatment of hernia, the authors undertook the treatment of 66 patients by this method in the Outpatient Department of the Hospital for Ruptured and Crippled, New York. Various solutions were used, but the authors found nothing which would lead them to believe there was any special value in one solution over the others. The average number of injections was 21, and the average length of treatment was one hundred and forty days. The complications were few, and none were serious. There were 4 deaths, but these were not definitely related to the injection treatment.

Because of failure of the injection treatment, subsequent operation was performed on several of the authors' patients. The interval between the last injection and the operation varied, but in all cases a sufficient length of time had elapsed to permit early proliferative changes to subside. In no case was there any evidence of a strong bulwark of built-up scar tissue which is claimed by many to result from the injection treatment. In fact, for the most part, there was little evidence of any residual tissue reaction of consequence. Reports of cures should be judged by the same critical standards as are used to judge results obtained by operation. Many of the previously reported cures do not conform to these standards.

Burdick and Coley summarize the results obtained in the cases they were able to trace. There were 47 known failures, and 11 possible cures, but of these, 9 are still wearing a truss. The authors conclude that it is difficult to deliver the solution to the exact spot where it is needed to obliterate the sac, and even when proliferation occurs the tissue reaction gradually absorbs or diminishes until a state is reached approximating that which existed prior to the injection. This strengthening of the defense against hernia is questionable except for the possibility of obliterating a narrow sac in an individual whose muscles and fascia are otherwise normal. The method depends upon the formation of scar tissue and it is generally accepted that scar tissue will stretch and is weaker than normal tissue. Until statistics are forthcoming to prove a higher curability of hernia by the injection method than they have been able to obtain, Burdick and Coley have decided to abandon the method entirely.

EARL GARSIDE, M.D.

**Frassineti, P.: The Surgery of Femoral Hernia** (La chirurgia dell'ernia crurale). *Clin. chir.*, 1937, 13: 517.

Frassineti reviews critically the various methods which have been employed in operations for femoral hernia. He presents his own technique, which has many advantages over older methods.

By sectioning the inguinal ligament, the constriction exerted by it upon the neck of the hernial sac is promptly relieved. In this way the hernial sac may be easily disengaged and extricated. All structures should be carefully examined and identified in order to avoid one of the most serious accidents, i.e., injury to the wall of the urinary bladder.

By preparation and careful dissection of the inguinal ligament, as shown in Figure 1, the deeper structures may be easily reached and manipulated. This is especially important in strangulated hernias which require especially careful manipulations and a sufficiently large operative field permitting a bowel resection in the presence of a gangrenous loop of intestine. This method offers also a better view of the operative field than can be obtained in other methods with a femoral approach. Furthermore, it eliminates unnecessary and improper traction on a viscus which may, as the result of circulatory embarrassment, be markedly edematous and friable, adherent, or sufficiently devitalized to produce a septic process in the peritoneal sac into which it has been placed. The author believes that this method is also far superior to the inguinal approach.

After the hernial sac has been isolated, the fatty layer enveloping it is divided and the sac is opened; necessary precautions must always be taken to avoid accidental injury to the urinary bladder. The subjacent intestine is inspected and in cases of strangulation with gangrene, or in the presence of adhesions, the incision may be extended upward to insure a field large enough to permit removal of the adhesions or a bowel resection.

The intestines are then replaced and the redundant portion of the sac is resected high enough to obliterate completely any bulging of the peritoneum. The stump is replaced as shown in Figure 2, and the structures making up the inguinal ring should be carefully identified and dissected out, especially posterolaterally, in order to expose Cooper's ligament and the large femoral vessels. Thus, during the repair work, the danger of injuring the femoral vessels or of leaving behind a dead space, which frequently gives rise to recurrences, is greatly minimized.

The hernial orifice is now closed and the wound is repaired in layers. With a thick and slightly curved needle a bite is taken through the aponeurotic border of the internal oblique, transversalis fascia, and Cooper's ligament, including also the anterosuperior border of the sectioned inguinal ligament. Usually three to four sutures are sufficient. After they are tied, they approximate Poupart's to Cooper's ligament and effectually close the hernial orifice. By means of the left index finger the external iliac vein is retracted in order to guard it against possible injury. Figure 3 illustrates this last step of the operation.

The aponeurosis of the external oblique muscle is now lowered and the cord or round ligament is replaced

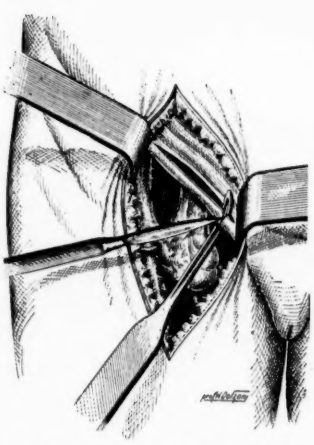

Fig. 1. Resection of the inguinal ligament near its pubic insertion.

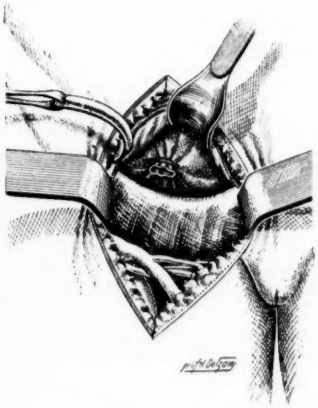

Fig. 2. Ligation and section of the hernial sac and replacement of the stump into the cavity.

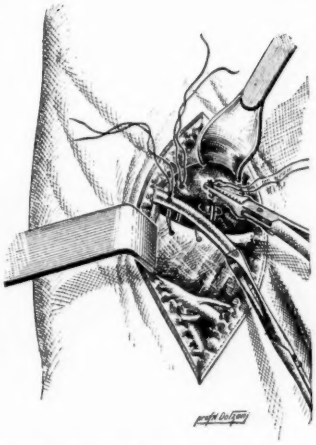

Fig. 3. First step in the closure of the hernial orifice.

in its original position. The aponeurosis of the external oblique muscle is sutured to Cooper's ligament and in this fashion the overlying inguinal canal is reinforced. The operation is terminated by reconstruction of the superficial layers in the customary manner.

With this method the author operated upon 23 patients in 5 of whom the hernia was strangulated. In 1 of these patients an intestinal loop was found to be gangrenous and had to be resected. The operations were all performed with great ease and healing of the wounds occurred by first intention. There were no recurrences observed.

RICHARD E. SOMMA, M.D.

**Grace, R. V., and Johnson, V. S.: Results of Herniotomy in Patients of More Than Fifty Years of Age.** *Ann. Surg.*, 1937, 106: 347.

This analysis deals with the results of herniotomy in 1,032 patients, all of whom were more than fifty years of age. It is quite apparent that herniotomy in this group is a more serious procedure, from the risk standpoint, than the same operation in younger patients. The mortality rate of 3 per cent indicates that only by taking every precaution before, during, and after operation, can this rate be decreased.

In more than 10 per cent of these patients, operation is non-elective due to irreducibility and strangulation. In a still larger group the patient, knowing the risks and possibilities of recurrence, will decide upon surgical interference after many years of truss wearing.

The recurrence rate of 25 per cent in primary inguinal hernias and 34 per cent in recurrent inguinal hernias may lead to erroneous conclusions. The operative result is judged by the standards of anatomical (objective) result and symptomatic (subjective) result. The anatomical result may, if it is true, show a high recurrence rate. More than 50 per cent of the recurrences are very small, however, and the patient is completely unaware of the fact. These small recurrences, for the most part, are without symptoms. Therefore, it is correct to state that in many of these patients with a poor anatomical result, as judged by the presence of a small recurrence, the symptomatic result is often excellent. The authors cannot too strongly emphasize the disparity in many cases between the anatomical and the symptomatic results of the operation. While the operator may note in his follow-up report many anatomical failures, the patient in many of these same cases is impressed by his complete symptomatic relief.

ELLA M. SALMONSEN.

## GASTRO-INTESTINAL TRACT

**Lake, N. C.: Partial Gastrectomy.** *Brit. M. J.*, 1937, 2: 49.

Partial gastrectomy was done on 320 patients, 115 of whom had gastric ulcer, 56 pyloric ulcer, 71 duodenal ulcer, 27 jejunal ulcer, and 51 carcinoma. The mortality for the entire group was 10.6 per cent, or 9.5 per cent for the patients with ulcer, 14.8 per cent for marginal or anastomotic ulcers, and 14.0 per cent for carcinoma. It was interesting to note that when the cases of ulcer were subdivided into their respective groups the mortality rate was 11.1 per cent for patients with gastric ulcer, 11.4 per cent for patients with duodenal ulcer and 5.3 per cent for patients with pyloric ulcer. The considerable difference in mortality was unexpected and is explained by the author as due to the associated technical difficulties occurring in gastric and duodenal ulcers from extension into adjacent tissues.

Chest complications caused 12 of the 34 deaths, pulmonary tuberculosis 2, internal and intraperitoneal hemorrhage 4, leakage and peritonitis 6, thyrotoxicosis 1, uremia 2, influenza 1, delayed shock 1, rupture and resuture of the wound 1, intussusception of anastomosis into the jejunum 1, damage to the midcolic artery 1, and embolism 2. Therefore, 5 deaths were due to activation of an intercurrent disease, while 3 were secondary to conditions indirectly connected with the operation. If these are excluded there remain 26 operative deaths, a mortality of 8.1 per cent for all cases, or 7 per cent for cases of ulcer.

One hundred and ninety-eight of a total of 269 patients with ulcer were followed for over two years. The results in 15 were unsatisfactory. When these 15 were further investigated, it was found that 50 per cent had a secondary complication which would explain their symptoms. Re-operation on 4 of the unsatisfactory cases showed a recurrence of ulceration in 2, but the other 2 were negative. When the entire series is studied as a whole, the cases with serious pathological conditions were found to give the better end-results. The percentage of unsatisfactory results was larger in the cases of duodenal ulcer than in the cases of gastric ulcer, but since the majority of the cases of duodenal ulcer gave satisfactory results, the author explains this as due to an error in the diagnosis, the symptoms really being due to other causes.

No case of pernicious anemia occurred in this series, although 27 cases developed in from ten to fifteen years after operation. A mild microcytic anemia did occur in some cases. It was, however, rarely severe enough to require treatment.

The postoperative study of cases of carcinoma showed that there was no relation between the size of the growth and the period of freedom from recurrence, provided there was no widespread metastasis at the time of operation. In this series 2 cases of carcinoma several inches in extent have remained free of recurrence for seven and nine years, respectively, while another, that of a young man, did not recur until six years had elapsed. The average duration of life following operation was, however, twenty-seven months. The freedom from symptoms to within a short time before death has been gratifying, and makes it advisable to continue with the operation even in the presence of secondary carcinomas beyond the possibility of removal.

Surgical intervention consisted of retrocolic radical resection much like the Finsterer type of intervention. Resection for exclusion is utilized when necessary although the author has developed his technique independently of Finsterer.

High spinal anesthesia with percaine is used; it is produced by a modification of the Howard-Jones method. Very small doses afford good anesthesia.

Drainage is used only when much oozing has occurred or when penetration of the pancreas or liver by the ulcer has rendered cauterization of these organs necessary.

Careful postoperative treatment is essential, and no surgery of this type should be undertaken without preliminary transfusion if the hemoglobin percentage is under 60.

The operation may take from 35 to 75 minutes. The mistake of "slighting" any part of the operation for the purpose of saving a few minutes is always avoided. SAMUEL J. FOGELSON, M.D.

**Bourde, Y., and Mosinger, M.: Enterogenous Cysts** (Les kystes entéroïdes). *J. de chir.*, 1937, 50: 289.

The authors report a case of cyst of the terminal ileum which occurred in a child ten years old, who was admitted because of violent abdominal pain of three days' duration. There was moderate fever, 37.8° C. A rounded movable mass was felt in the lower right portion of the abdomen. The pre-operative diagnosis of possible appendicitis was made. At operation a normal appendix was removed. A bluish, spherical cyst, of the size of a walnut, was found in the terminal ileum, almost completely obliterating the lumen. Enucleation of the cyst was impossible without opening of the intestine, as the intestinal wall itself was continuous with one side of the wall of the cyst. Removal of the cyst left a defect in the intestine the size of a ten-franc piece, which was closed transversely by suture. This so occluded the lumen that an entero-enterostomy was done between the ileum and the ascending colon around this obstruction. Convalescence was uneventful and the patient was discharged on the twenty-seventh day. Examination of the cyst showed that the lining consisted of a cylindrical epithelium, with occasional formations of a gland-like structure similar to the glands of Lieberkuehn. The epithelium varied from high columnar, through cuboidal, to flattened cells resembling endothelium. There was a thin, poorly developed stroma, no muscularis mucosa, and no smooth muscle. The outer free border of the cyst was covered by visceral peritoneum, so that the cyst was of the subserous type.

Intestinal or enterogenous cysts are usually classified as submucous, intramuscular, subserous, and para-intestinal; the subserous variety is the most frequent. Usually this type is along the anti-mesenteric border, but if it is near the mesentery it may extend between the leaves of the mesentery and it may be difficult to remove it without disturbing the blood supply to the bowel. The ileocecal region, usually on the small bowel side, is the most frequent location. Usually the cysts do not communicate with the lumen of the intestine.

The authors recommend the following classification:

1. Extra-intestinal cysts
   a. Cysts of the mesentery
   b. Retroperitoneal cysts
   c. Para-intestinal cysts
2. Parieto-intestinal cysts, in which the cyst is in the wall of the intestine.

The usual size of enterogenous cysts is from 5 to 8 cm. in diameter; the largest described was 10 cm.:

the smallest was 1.7 by 0.8 cm. They are usually more or less spherical, although elongated, sausage-shaped cysts have been reported. The contents vary from clear, colorless, or yellowish fluid, to turbid, milky, viscid fluid. The wall of such cysts varies from a completely developed intestinal wall with all layers represented, to a thin structure of flattened epithelium. As a rule only epithelium and stroma are present with no submucosa, muscularis mucosæ, or muscle layer. It is generally accepted that such cysts arise from embryological intestinal diverticula rather than from Meckel's diverticulum, as some have suggested. The cysts are usually observed in children and young adults under twenty years of age. Seventy-five per cent of the reported cases have occurred in females.

Enterogenous cysts usually cause no clinical sign unless a complication, such as obstruction, intussusception, volvulus, torsion, or infection occurs. In rare instances a neoplasm has been found in such a cyst. The clinical signs are therefore dependent to some extent on the nature of the complications which are present. A spherical or elongated abdominal mass may often be felt. A correct pre-operative diagnosis is practically impossible.

Treatment depends somewhat on the situation and variety of the cyst. The extra-intestinal cysts can usually be enucleated, unless they lie in the mesentery in such a position that their removal would interfere with the blood vessels to the intestine and necessitate resection of the cyst, mesentery, and a segment of the bowel. In rare instances, marsupialization may be necessary, but it is not recommended. In the parieto-intestinal variety resection should be attempted, as a cleavage plane can often be found. If no cleavage plane is found, resection of the cyst and bowel with anastomosis, or a procedure such as the authors used, may be necessary. In the reported cases excision and enucleation have given better results than intestinal resection.

M. M. ZINNINGER, M.D.

**Fiske, F. A.: Intussusception Due to Intestinal Tumors.** *Ann. Surg.*, 1937, 106: 221.

The author divides intussusception into two groups: primary and secondary. The primary group has an acute onset, occurs in the ileocecal region chiefly in infancy, and once it has been reduced, rarely recurs. In this group gross causative pathology is seldom found. The secondary group usually has a chronic or recurrent onset, occurs in adults and older children, and tends to recur if the causative pathology is not removed.

Intestinal tumors, either benign or malignant, intestinal ulcers due to typhoid, dysentery, tuberculosis, and Meckel's diverticula are the most common underlying pathological lesions. Intussusception frequently calls attention to a small intestinal tumor which is more commonly benign than malignant. Of the benign tumors, adenomas occur most frequently, though many cases of lipoma have been reported. Sarcoma of the intestinal tract is a rare lesion, and when it occurs is most often found in the small bowel, particularly the ileum. Melanomas of the ileum have been reported, but not many. Carcinoma of the small bowel is a rare condition which frequently leads to intussusception.

Four cases of intussusception due to adenomas of the jejunum, lipomas of the cecum and ascending colon, reticulum-cell sarcoma of the ileum, and melanoma of the ileum, respectively, are reported. In one of these, three operations were required for a cure.

THOMAS C. DOUGLASS, M.D.

**Spriggs, Sir E.: The Incidence and Treatment of Diseases of the Colon.** *Proc. Roy. Soc. Med.*, Lond., 1937, 30: 1211.

The author presents some observations on the diagnosis and treatment of colonic disease, made during the study of 1,574 cases of diverticulosis, colitis, dysentery and carcinoma, excluding the rectum.

The value of sigmoidoscopy and x-ray examination is stressed. Ptosis of the colon is said not to be related to constipation, but the real disorder is the general loss of nervous and physical tone. In 10 per cent of the patients the complaint of constipation was not justified. Of 1,000 patients in whom a delay was demonstrated, one-half of the colon was involved; in one-third of these patients, the sigmoid and rectum were involved, and in 11 per cent, the rectum only. Nearly 25 per cent of the patients were unaware that they were constipated. Failure of defecation is not usually due to weakness or paralysis of the bowel muscle, but to undue drying and hardening of the feces and the absence of normal stimulus, or to irritation or pain of some local lesion. Treatment should be directed toward the restoration of normal conditions. The diagnosis of intestinal auto-intoxication is to be regarded with suspicion, as the true condition is usually found to be some organic disease.

An incidence of redundancy of the sigmoid, amounting to 3 per cent, was observed. It is suggested that the deficient shortening on evacuation during the years of constipation may tend to cause elongations of the bowel.

Mucomembranous colitis has become less common recently, and this may be due to the widespread teaching of the harm of daily purgation, and the beneficial effects of better balanced diets. In ulcerative colitis, most of the bacteriological methods of treatment have proved disappointing.

A prediverticular state has been observed in 132 of 564 consecutive cases of diverticulosis. This appears to be due to local spasm of groups of muscular fibers. Observations suggest that there is some preceding process, probably inflammatory, which determines the site at which pouches will develop. Diverticula may remain quiescent for years, or until the end of life, but occasionally the necks become inflamed and inflammation spreads to the bowel wall. Pain, bowel irregularity, and backache may result. Operative intervention is not very often nec-

essary, because medical measures frequently result in a remission.

The average age of 64 patients with carcinoma of the colon was sixty-two years. The sex incidence was 3 men to 1 woman. According to the mode of onset, distribution was made as follows:

1. Bowel disturbance, 36 cases.
2. Pain, 17 cases.
3. Discomfort in upper abdomen or nausea, 11 cases.
4. Blood in the stool, 11 cases.

Diverticulitis and carcinoma were found together in 6 patients. The tumor was excised in 13 patients, and the operation was successful in 8, 2 of whom were living ten years later. JOHN A. GIUS, M.D.

**Haberer, H. von: Experiences with One-Stage Resection of the Colon and Improvement of the Technique** (Erfahrungen mit der einzeitigen Dickdarmresektion und Verbesserung ihrer Technik). *Wien. klin. Wchnschr.*, 1937, 1: 825.

According to von Mikulicz and Schloffer, the two-stage resection of the colon was preferred formerly because of its better results. At the Fiftieth Surgical Congress, Nordmann reported that there was no essential difference in the mortality statistics of the one-stage and the several-stage resections. The author always favored the one-stage method. It was unusual to find that a few patients, on whom he operated with this method, died, not from insufficiency of the suture and peritonitis as is usual, but from an atony of the intestines. Hering was able to show in animal experiments that electrically produced peristaltic waves do not at first pass beyond the intestinal suture with the end-to-end intestinal suture. From this it is evident that primary resection should not be done in the presence of severe stasis and acute intestinal obstruction. Reichel, who formerly was an enthusiastic supporter of the one-stage resection, stated later that only a minority of the cases are suitable for it.

The author then mentions the objections to a several-stage resection: (1) the double operation; (2) patients sometimes feel so well with the artificial anus, that they believe the second operation is no longer necessary; (3) a tumor still operable at the time of the first operation becomes inoperable at the time of the second operation; and (4) cases with extensive glands in the mesentery, with a too short and rigid mesocolon, or very large tumors adherent to other organs, do not permit proper exposure, so that one is compelled to do a one-stage operation if one does not wish to abandon the operation because of inoperability.

In order to avoid the atony of the intestines the author establishes an orally placed intestinal fistula in cases of left-sided tumors of the colon, or, when he cannot do an end-to-end suture, he sews in the oral stump. With tumors of the ascending colon he establishes a fistula in the small intestine. With the fistula in the colon he also establishes a Witzel type of fistula, which later closes spontaneously. In order to avoid the second operation for the artificial anus he closes the oral end blindly at the site where he would have to establish the anus and sews it into the region of the abdominal wound, so that, when necessary, he can open it with the cautery. In the cases in which he did not need to open it, he found that the gut retracted and the wound healed spontaneously. In some cases he closed the lumen of the gut over a thick catheter in the manner of the Witzel or the Kader fistula. The relief fistula safeguarded the patient from intestinal atony. The catheter was removed from the seventh to the twelfth day, and the fistula closed spontaneously.

The author then discusses whether primary resection should be avoided from the start in acute intestinal obstruction. If the circulation is still good, he is not deterred from resection in carefully selected cases. In 16 of such cases insufficiency of the suture never occurred, but a relief fistula always had to be established. Of 172 patients with one-stage resection of the colon without a relief fistula, 45 (25 per cent) died, mostly from peritonitis as a result of insufficiency of the suture or intestinal atony. Of 109 patients with relief fistulas, 22 (20 per cent) died, but only 9 (8 per cent) succumbed directly from the results of the operation. In these, insufficiency of the suture occurred three times, lymphogenic peritonitis once, gas phlegmon of the abdominal walls four times, and twice-occurring total prolapse once. The gas phlegmons originated from degenerated cancers. Since the time of this experience, the author operates only with the electric knife.

(FRANZ). LOUIS NEUWELT, M.D.

**Allen, A. W.: Right Colectomy for Malignant Disease: A Discussion of the Mortality Associated with Various Operative Procedures.** *J. Am. M. Ass.*, 1937, 109: 923.

The author bases his discussion on the results obtained at the Massachusetts General Hospital, Boston, during the period from 1925 to 1936 inclusive, in a series of 653 patients who were operated upon for carcinoma of the large bowel. Right colectomy is technically an easy procedure. The slow development of cancer in the right colon, with its tendency to remain localized, makes that location a particularly favorable site for cure. In spite of these facts, however, statistics show that the operative mortality is slightly higher for right colectomy than it is for surgical removal of cancer in the left large bowel. In cancer of the right colon, obstruction develops less frequently. The necessity for preliminary drainage is less frequent and the simplicity of resection aids in the temptation to subject these patients to a radical one-stage operation. One group of surgeons is of the opinion that a one-stage operation should be carried out in the majority of cases; another group believes that some form of a two-stage procedure should always be employed. Regardless of details, certain definite general principles dealing with cancer of the large bowel are now generally accepted.

Patients reach the surgeon in all stages of obstruction, with severe anemia, and even with full blown general peritonitis from perforation. Each patient presents an individual problem as to operability. Patients with acute obstruction should have an early preliminary drainage of the bowel by cecostomy or colostomy for lesions distal to the hepatic flexure, and by ileotransverse colostomy if the growth is in the cecum or ascending colon. Cecostomy usually suffices in cases of acute obstruction from any lesion beyond the hepatic flexure, and is useful as a first stage in later resection of the large bowel. It also makes a valuable safety valve proximal to the suture line after the resection.

Many surgeons prefer colostomy proximal to the obstruction in the left bowel. This may complicate future procedures. Depleted patients should be brought into a more normal state of physiological balance prior to resection. The administration of water, chlorides, dextrose, and blood are essential. The vitamins, and especially cevitamic acid, may promote wound healing. The author favors the two-stage operation. He believes that part of the benefit derived from any two-stage procedure on the large bowel may come from the added resistance that the peritoneal cavity attains after the less radical preliminary stage. The smooth convalescence of the average patient who has had a preliminary drainage or short circuit from seven to fourteen days previous to resection of the large bowel, as compared to the frequent stormy postoperative course following the same operation done in one stage, has been observed by every surgeon of wide experience in this field. Gross contamination should be avoided during the operation. The peritoneal cavity will withstand a considerable amount of contamination but not gross soiling with spilled fecal material. A leaking suture line will almost invariably result in fatal peritonitis unless the leak is of slow development. In such instances, an abscess may form which, when drained, ends in a fecal fistula.

Immediately after resection a blood transfusion should be given routinely. Special nursing will prove a good investment for the first twenty-four hours after operation, and pulmonary complications may often be avoided. A liberal use of morphine is desirable as it diminishes the amount of bowel distention and maintains a slow, regular peristalsis. Fluids are best given by infusions of dextrose and chloride solutions into the veins. An inlying Levine tube will eliminate nausea and serve to keep the stomach empty. Proctoclysis is recommended with saline solution. The diet during early convalescence should consist of non-gas-forming foods.

Peritonitis accounted for 30 per cent of all the deaths following resection of the large bowel. These deaths represented 6 per cent of the 400 one-stage operations and 3.5 per cent of the 253 two-stage operations. The majority of cases of peritonitis occurred in patients upon whom an open anastomosis was used. Pulmonary complications rank next as the cause of death.

In conclusion, the author states that carcinoma of the right colon is a favorable lesion for cure. It is technically easily removed. The mortality, however, is higher than that resulting from resections for cancer elsewhere in the large bowel. The lack of obstruction in cases of cancer of the right colon so often eliminates the necessity of preliminary drainage that one is tempted to subject the patient to a one-stage operation. The author recommends a preliminary ileotransverse colostomy through a left abdominal incision, either a lateral or an end-to-side anastomosis, followed in from ten to fourteen days by a resection of the excluded bowel through a right abdominal incision. The aseptic anastomosis of the Parker-Kerr type gave a lower mortality for all intestinal suture than any of the other methods employed.

JOHN W. NUZUM, M.D.

**Bennett-Jones, M. J.: Primary Solitary Diverticulitis of the Cecum.** *Brit. J. Surg.*, 1937, 25: 66.

To 17 previously recorded cases of primary solitary diverticulitis of the cecum, which the author found in the accessible literature, he adds 3 cases that have recently come to the attention of surgeons associated with the Liverpool Royal Infirmary.

The author believes that symptoms occurring as a result of right-sided diverticula are very rare. He could find only 17 cases of this disease in the literature, and 2 additional cases of cecal diverticula not inflamed. He is also of the opinion that a few cases of "appendix abscess" which had been operated on later, when a normal appendix was found, were cases of perforated diverticulitis of the cecum.

He discusses the etiology, pathology, clinical features, differential diagnosis, treatment, and prognosis, and summarizes his paper as follows:

The occurrence of 3 cases of this disease in Liverpool within three months shows that it is more common than the literature suggests.

There is evidence that a few of these diverticula with a complete muscular coat may be congenital, but the majority are probably acquired. Tuberculosis, either healed or active, may be the cause of a few of the acquired cases.

It is a disease with both a medical and surgical mortality. It is of great interest to surgeons because it may be found when operation is performed for the most common surgical emergency. It is likely to be overlooked, and when it is found its true nature is not obvious. The operator will usually be dubious about the correct surgical procedure and is very likely to perform an unnecessarily radical operation.

EMIL C. ROBITSHEK, M.D.

**Donati, G. S.: Contributions on the Recognition of Intercurrent Morbid Factors Between the Appendix and the Urinary Tract** (Contributo alla conoscenza dei rapporti morbosi intercorrenti fra appendice e vie urinarie). *Ann. ital. di chir.*, 1937, 16: 527.

The author gives a short review of the associated anatomy and physiopathology of the appendix and

the right side of the urinary tract; he then discloses the relative frequency of urinary symptoms as well as urinary findings elicited during an attack of both the acute and chronic forms of appendicitis.

Six illustrative cases of acute and chronic appendicitis together with complete cystoscopic, functional and roentgenographic studies of the urinary tract are presented in detail. All of the patients showed some form of anatomical alteration of the urinary tract, varying from hydronephrosis to dilatation with stone formation and ureterectasia.

In the author's experience a great many of the patients with urinary symptoms, pain and hematuria, from an anomaly on the right side of the urinary tract associated with appendicitis were definitely relieved of such symptoms by appendectomy. GEORGE C. FINOLA, M.D.

**Miller, E. M., and Turner, E. C.: The Surgical Management of Appendicitis in Children.** *Illinois M. J.*, 1937, 72: 222.

Miller and Turner review the results obtained during the past three years at Cook County Hospital, Chicago, in a series of 613 patients who were treated for acute appendicitis and its complications. All were children, and the cases could be divided into 3 clinical groups.

Group I consists of 329 children whose histories and physical findings revealed acute appendicitis before the stage of perforation. There was no mortality in this early stage of appendicitis. All patients in this group except those in whom the infection was in the subsiding stage upon admission to the hospital were subjected to immediate operation.

Group II represents those patients who, when first seen by the physician or surgeon, showed a localized inflammatory mass. These were cases of perforation against which there had been set up, from the start, an adequate defense mechanism. The so-called appendiceal abscesses varied greatly in size and location. Some of these were as large as a small orange. The mass was palpable deep in the flank of some of the patients; in others, it was found to be deep in the pelvis, and even in the left lower quadrant. These abscesses may occupy any position in the right side of the abdomen and can be determined only by rectal or bimanual examination. The authors believe that conservative treatment is the best procedure for abscesses of this type. Following treatment, patients are routinely advised to return in three or four months for removal of the appendix. Increase in size and spread of the abscess were evident in a few cases in this group, and it is believed that the abscess may ultimately point anteriorly, laterally, or deep in the pelvis. Under these conditions, simple drainage through a small incision into what amounts practically to an extraperitoneal approach may be safely accomplished with a low mortality rate.

Group III comprises those cases of acute perforation lacking an adequate defense mechanism. They represent, pathologically, the obstruction type of appendicitis with perforations of considerable size. The streptococcus may be the predominant organism. The findings tend to be generalized instead of localized, while the acute general tenderness and rigidity suggest a rapidly spreading general peritonitis. While the treatment of this type of case has been the subject of wide controversy, the authors believe that surgical removal of the source of infection, combined with adequate drainage when drainage seems to be necessary, is the most effective procedure for avoiding a fatal outcome. In these severe cases of spreading peritonitis, the resistance of the peritoneum becomes impaired in proportion to the degree to which the blood supply of the bowel is disturbed by gaseous distention. The use of the duodenal suction tube, and the introduction of a catheter through the stump of the appendix or through the cecal wall constitute valuable measures which aid recovery. While it is certainly impossible to drain adequately the peritoneal cavity, nevertheless drainage with the rubber covered type of Penrose cigarette drain is routinely employed when drainage is considered necessary. In retrocecal types of perforation, such drainage may forestall the development of a subdiaphragmatic abscess. In this third group of 163 patients there was a mortality of 22.7 per cent. JOHN W. NUZUM, M.D.

**Gray, H. K., and MacKenzie, W. C.: Acute Appendicitis: Analysis of Results of Both Operative and Non-Operative Treatment in 674 Consecutive Cases.** *Surg. Clin. North Am.*, 1937, 17: 971.

Group I contained 495 cases, 73.4 per cent, in which an unperforated, acutely inflamed appendix was removed. Groups II and III each contained practically the same number of cases, 90, 13.3 per cent, and 89, 13.2 per cent, respectively.

It is striking to note that of all the patients who had acute appendicitis without rupture, 90.6 per cent were less than forty years of age. In those cases in which perforation had occurred, the age distribution by decades was more nearly equal, and this probably suggests that when acute appendicitis occurs in the fourth, fifth and sixth decades, it is more likely to progress to the point of perforation because of the greater difficulty in making a correct diagnosis.

Very little information could be elicited from a study of the sex incidence, as the ratio of males to females was remarkably consistent in all groups; 52.7 per cent of all the patients were males.

The tendency to procrastinate before seeking medical advice has been proved to be unwise in many diseases, and not the least important of them is acute appendicitis. Of the patients whose appendix was removed before perforation occurred, 66.1 per cent sought treatment within twenty-four hours of the onset of the disease, and 80 per cent were seen before forty-eight hours had elapsed. Of those patients in whom perforation had occurred and an abscess had formed, only 18.8 per cent received professional medical care in the first two days of the disease, whereas 40.4 per cent of the patients with diffuse

peritonitis had been ill for an equal period. Although the incidence of perforation increased in direct proportion to the length of the illness, it should be noted that an appreciable number of persons without perforation, 20 per cent, stated that the illness had persisted over forty-eight hours and 5.4 per cent of the group noted symptoms for one hundred and forty-five hours or more.

The location of the pain at the onset of illness was generalized in 43.2 per cent of the cases in Group I but had begun in or had been projected to the right lower abdominal quadrant in 80.6 per cent of these cases. Of the remaining patients without perforation, 6.9 per cent had had generalized abdominal pain; in 3.4 per cent the pain had persisted across the lower part of the abdomen, and in 3.1 per cent the pain was referred to the epigastrium without projection. The fact should be stressed also that the behavior of pain in acute appendicitis is not consistent, and that the possibility of the disease should be considered in any case in which there is abdominal distress.

Nausea and vomiting were present in nearly equal proportions in all groups, although these symptoms were noted somewhat more frequently in patients with generalized peritonitis.

The value of the leucocyte count in the diagnosis of acute appendicitis has been overemphasized, and the accuracy of any present method of counting has been seriously challenged. However, if full reliance is not placed on this count as a positive means of differential diagnosis and its limitations are realized, it has some value as an added bit of information in the clinical picture.

In practically all patients with simple acute appendicitis, 96.7 per cent, tenderness was elicited in the right lower abdominal quadrant, although in 2 cases tenderness was generalized and in 4 cases there was no tenderness on palpation.

Rigidity was absent in a surprisingly large number of cases in the first two groups, but was present in the right lower abdominal quadrant in practically all of the other cases in these groups.

Perhaps the most significant finding in this study was the relatively high mortality when patients with diffuse peritonitis were treated primarily by the accepted conservative methods. It should also be noted, however, that 7 patients were not operated on because their general condition was never such that exploration seemed justifiable. Among those patients who were operated on eventually there was a mortality of only 10 per cent.

This report has been based on a study of the results of operative and non-operative treatment in 674 consecutive cases in which a positive diagnosis of appendicitis with or without diffuse peritonitis or abscess was verified by pathological examination at some stage in the disease. Clinical and laboratory data together with end-results have been tabulated. Emphasis has been laid on the importance of treating each patient as an individual problem and of refraining from following any dogmatic plan of procedure, particularly when perforation has occurred and there has been diffuse soiling of the peritoneal surfaces without evidence of localization.

## LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

**Liedberg, N.: Clinical Studies on Acute Cholecystitis** (Klinische Studien ueber die akute Cholecystitis). *Acta chirurg. Scand.*, 1937, 79: Supp. 47.

A study of the literature seems to indicate that there is an increasing tendency to operate upon cases of acute cholecystitis during the early stages of the disease. It is believed that the eradication of the diseased organ hastens recovery with a lessening of coincident changes in essential organs, notably the liver. Moreover, there is a belief that the mortality is no higher, and is perhaps lower, than when conservative treatment is employed. One of the chief aims is the prevention of serious complications, such as perforation of the gall bladder and spreading peritonitis. A summary of the evidence in the literature suggests the question whether cases of acute cholecystitis should be operated upon in the course of the disease while the symptoms are in the ascent or when the symptoms are on the decline or have abated.

A study of the material in the Lund Surgical Clinic during the ten-year period from 1924 to 1933 shows that 556 patients with acute cholecystitis were under observation. Of these, 291 were operated upon at the time of their first admittance to the clinic and 17 on readmission, which make a total of 308 operated upon during the acute or subacute stage. In the group of patients in whom a cholecystectomy was performed, the mortality was 6.8 per cent. Among 20, all in poor condition, in whom cholecy tectomy was done, the mortality was 50 per cent. However, in a compilation of the statistics it was noted that during the five-year period from 1924 to 1928 more operations were performed in the acute stage than during the second five-year period.

A study of the blood-sedimentation rate in acute cholecystitis seems to offer considerable aid since there appears to be a close relationship between the clinicopathological picture and the blood-sedimentation rate. In two-thirds of the cases a rise in the rate was found as early as the first day. During the time the disease is increasing in severity, there is, in most instances, a rise in the sedimentation curve; at the end of three or four days it reaches the apex of the curve. As the disease abates, there is a gradual fall in the sedimentation rate, so that in from two to four weeks it has become normal again. It was also noted that the sedimentation curve in the severe cases was higher than in the mild ones. A study of the material indicates that the sedimentation rate is a good criterion or diagnostic sign as to when the inflammatory process has completely subsided in the event that an interval operation is contemplated.

Perforation of the gall bladder during an attack of acute cholecystitis is a serious complication which is not uncommon. In the Lund Clinic, it occurred in 7.2 per cent of 319 cases. The diagnosis in many

instances is extremely difficult. The logical treatment is prevention, and this can best be done by early operation before perforation has taken place. The ideal procedure is cholecystectomy with drainage of the operative site. The mortality in 9 cases of acute perforation was 55 per cent, while in 14 cases of slow or subacute perforation it was 14 per cent.

Conservative medical treatment of acute cholecystitis did not yield satisfactory results. Of 117 cases which were not operated upon, re-examination after periods of from five to twelve years showed that about one-fourth were symptom-free. Of all the 244 cases not operated upon, a follow-up study after periods of from two to twelve years showed that 13.5 per cent had been operated upon later, and 7.8 per cent of the cases had terminated fatally either without operation or in connection with an operation.

The material from the Lund Clinic seems to warrant cholecystectomy, with choledochotomy when indicated, performed as early as possible during the acute stage of the disease. Cholecystostomy should be done only when necessary. All severe cases of acute cholecystitis should be operated upon immediately without regard to the date of onset. Moreover, all cases of mild or moderately severe cases of cholecystitis should be operated upon during the first two or three days of the disease provided there are no specific contra-indications for the following reasons: (1) the acute process will then be cut short immediately and the risk of acute exacerbations associated with expectant treatment will be eliminated; (2) the patient's general condition and resistant powers are less affected the sooner an operation is done; and (3) as far as can be judged from the material from the Lund Clinic, the late results in those cases operated upon early appear to be better than those in the cases operated upon at a later stage. Cases of moderately severe, or mild acute cholecystitis in which the symptoms are on the decline after the first few days should not be operated upon immediately, for at operation during the healing stage it is a common experience to find the tissues adjacent to the gall bladder undergoing organization so that the technical difficulties of the operation are increased and an unnecessary risk is taken. In such cases the operation should be postponed until healing is complete, as indicated by the blood-sedimentation levels.

In the Lund Clinic material common-duct stones were found or their existence was thought highly probable in 17 per cent of the cases of acute cholecystitis. It is therefore a matter of some moment in dealing with cases of acute cholecystitis. There is no doubt that exploration of the common duct during cholecystectomy for acute cholecystitis adds to the risk of the operative procedure; however, it should be done if the history and clinical and operative findings indicate the probability of common-duct stones. Bilirubin values of over 300,000 or 200,000 or a urinary diastase value of 512 or more during any time of the acute stage should indicate a choledochotomy. It is relatively uncommon to find stones in the common duct in acute cholecystitis when the gall bladder is found to contain a single stone and still more uncommon when there is a large stone obstructing the neck of the gall bladder or the cystic duct.

A follow-up study after cholecystectomy for acute cholecystitis in 260 cases observed for periods of from two to twelve years shows good results in about two-thirds of the cases, satisfactory results in about one-sixth of the cases, and a less satisfactory or unsatisfactory result in about one-sixth of the cases.

JOHN A. WOLFER, M.D.

**Walters, W.: Newer Concepts in the Management of Acute Cholecystitis.** *Surg. Clin. North Am.*, 1937, 17: 961.

It is necessary to differentiate attacks of acute cholecystitis from those of subacute perforation of a duodenal or gastric ulcer In such cases a previous history of an ulcer type of dyspepsia is always significant and assists in making the differential diagnosis.

Until 1933, the consensus among most American surgeons was that it was wise to postpone operating on a patient with acute cholecystitis until the acute manifestations of the inflammation had subsided, provided the patient's general condition continued to improve and there was an associated decrease in temperature, pulse rate, and the leucocyte count. There were, however, certain advocates of immediate operation in cases of acute cholecystitis. At the 1933 meeting of the American Surgical Association, a symposium on the treatment of acute cholecystitis was held. Three excellent papers were presented by Stone and Owings of Baltimore, Morris K. Smith of New York, and Judd and Phillips of Rochester, Minnesota. A review of these papers seems to indicate an increasing tendency on the part of these men to favor earlier operations in cases of acute cholecystitis.

*Stone and Owings.*—"When the cystic duct is completely blocked and increasing tension develops within the gall bladder, there can be no reasonable hope of a spontaneous recession of the process... We think that by prompt operation there is a notable saving of time, pain, expense and danger as compared with the policy of delay. . . . Not only do we regard the acute gall-bladder lesion whether hydrops, empyema, torsion, gangrene or simple acute cholecystitis, as best treated by prompt operation, but again contrary to general opinion we believe that in most cases the operation should be a cholecystectomy."

*Smith.*—"I have been impressed with the favorable postoperative course of patients subjected to early cholecystectomy and have operated before the fever subsided in a majority of my own cases without feeling that an error of judgment had been made until rather recently. . . . Patients with acute cholecystitis should not be operated on immediately upon admission without an urgent indication. The surgeon should be ready to intervene promptly if progress is unfavorable. Younger patients in good condition after a day or two of preparation may be

operated upon without waiting for the attack to subside."

*Judd and Phillips.*—"We shall probably not be able to settle the question of when to operate in the acute cases, but the present tendency is to carry out surgical treatment early in cases of acute cholecystic disease. Apparently there is not the same fear of operating in these cases as there formerly was. . . . Our study of this group of 508 surgical patients (operated upon at the The Mayo Clinic) would seem to bear out these conclusions, although the operations were performed by several surgeons, among whom there were bound to be differences of opinion. . . . Although we wish to subscribe to the plan of early operation in acute cholecystic disease, and although this coincides with the opinion expressed in the more recent literature on the subject, nevertheless we feel that there are certain instances in which surgical treatment should be postponed. In some cases it should be delayed for a long time. . . . There is no set plan that will fit all cases. . . . Cholecystectomy will not be permissible in every case, but this procedure should be carried out whenever feasible. . . . No one would feel that a deeply situated, inaccessible, acutely inflamed gall bladder should be removed from an extremely sick person. Cholecystostomy may be all that is warranted."

Walter's experience in the management of such cases led him to believe that if the patient is seen in the early stages of the attack, operation can be carried out with safety. On the other hand, if the patients are not seen until the second or third day of the disease, and the infection should appear to be subsiding, he has found it of advantage in some of these cases to delay operation for one or more days. Although some generalizations may be made regarding the time for surgical attack, there is no doubt that the cases vary so much that decision in each case has to be made on the merits of the case, with particular reference to the condition of the patient and the progress of the infection.

In order to see whether such a viewpoint could be substantiated in the surgical results, Wesson and Montgomery reviewed the case histories of 76 consecutive patients with acute cholecystitis who were recently operated on at The Mayo Clinic, from January, 1934, to July, 1936. In this series there were 3 deaths, or a mortality of 3.9 per cent. In 65 of the cases cholecystectomy was performed. In the 11 cases in which cholecystostomy was performed, it was necessary to perform cholecystectomy in 2 instances in the subsequent year because of recurring symptons. In all but 4 of the 76 cases stones were associated with the acute cholecystitis, and in 2 of these 4 cases the stone or stones had apparently passed into the common bile duct, and produced symptoms shortly after the patient's dismissal. In all but 3 of the cases there was a previous history of attacks of biliary-tract disease. The duration of the attack of acute cholecystitis which brought the patient to the hospital varied from a few hours to five weeks.

After discussion of the question of the proper time for surgical attack upon the acutely diseased gall bladder, the question of the anesthetic is of next importance. Generally speaking, in cases in which patients are seriously ill, the safest anesthetic in Walter's experience has been abdominal-wall block with procaine, supplemented by one of the gas types of anesthesia and the addition of ether as necessary to obtain relaxation. Spinal anesthesia has a very important place in operations on the obese individual with acute cholecystitis, as well as on patients with associated respiratory infections, such as bronchiectasis.

Whereas Walters is in accord with the opinion expressed by Stone and Owings in advising cholecystectomy, there is a group of cases, as Judd and Phillips have mentioned, in which the preferable procedure is cholecystostomy. In such cases the patients are usually obese, or elderly, and in poor condition, and exposure of the gall bladder and the common bile duct is difficult either because of the extent of the inflammation or the inaccessibility of the hepaticoduodenal ligament. The method of cholecystectomy described many years ago by W. J. Mayo for cases of this type has served to facilitate the ease of the operation as well as exposure of the common duct. The method consists of dissecting the gall bladder from the liver, by using the forefinger of the left hand and separating the gall bladder from the liver by blunt dissection just above the cystic duct. The gall bladder can then be easily dissected from the liver, reflected forward, and the cystic duct and cystic artery separately isolated. In such cases bleeding from the liver notch can be readily controlled by mattress sutures placed over strips of gauze occupying the position of the gall bladder in the liver notch. Such gauze tampons should not be removed until the ninth or tenth day, or should be left in place even longer if they appear to resist attempts at removal. The use of antiseptic solution poured into the sinus tract is of value in loosening the gauze from the liver. When the patient has been jaundiced and the common duct is enlarged, and when the condition of the patient permits, Walters has not hesitated to open and explore the common duct for stones, and in a few cases has found them to be an accompaniment of acute cholecystitis.

Postoperative care consists largely in treating symptoms as they arise. It is essential that an adequate fluid intake be maintained.

**Kunath, C. A.: The Stoneless Gall Bladder. An Analysis of 100 Cases Treated by Cholecystectomy.** *J. Am. M. Ass.*, 1937, 109: 183.

Kunath calls attention to a definite dyspepsia syndrome which includes gaseous indigestion, inability to digest fatty or greasy foods, belching, distention, vomiting, and flatulence, which he believes is largely responsible for the problem of the stoneless gall bladder. He reports a follow-up study of 100 uncomplicated surgical cases of non-calculous cholecystitis. A similar study for the purpose of

comparison was made on 100 consecutive cases of chronic cholecystitis with calculi. The only other operative procedure in both series of cases was simple cholecystectomy.

The age incidence was almost identical in both groups, and averaged 42.3 years in the non-calculous group and 41.9 years in the calculous group. The theory that the non-calculous cases represent the earlier cases in respect to duration of symptoms before admission to the hospital was held with regard to both groups. It is interesting to note that females outnumbered males in both groups, but there were more males in the non-calculous group than in the calculous group.

From the standpoint of the symptoms, it was found that symptoms were always more pronounced in the group with stones. Of the non-calculous cases, 56 per cent gave a history of biliary colic which was accompanied by severe colicky pain requiring hypodermics for relief. It seems that causes other than stones are responsible for the biliary colic.

A careful study of both groups emphasized the fact that the non-calculous cases showed a greater morbidity, a higher postoperative mortality, and only about half as many cures.

Careful analyses were made from the standpoint of pathological changes in the gall-bladder wall of the non-calculous cases. In a general way the percentage of good results rose steadily as the pathological processes in the gall bladder became more advanced. However, there are some phases of these analyses which are somewhat perplexing. A disturbing factor is the relatively high percentage of cures in the group of patients with normal or nearly normal gall bladders. Many patients get relief from the symptoms after removal of a gall bladder showing very little pathological change. It appears that while histological changes may be nil or slight, functional or physiological disturbances of the gall bladder which in no way produce any anatomical change, can be present. Therefore, a pathological report can offer no accurate index as to the possible benefit that may result from cholecystectomy.

From the standpoint of cholecystographic evidence, again we meet facts that are difficult to explain. Cholecystography as a means of diagnosing gall-bladder disease has come to be considered an accurate test in a high percentage of cases. As a rule cholecystectomy is rarely advised when there is a normal cholecystogram. Nevertheless, in this study of Kunath's it appears as a significant fact that 75 per cent of the patients with normal cholecystograms were cured. It is possible that incidental appendectomy is responsible for the cures in this group with normal cholecystograms. One is obliged to concede that while cholecystography is a contributing factor in the diagnosis of gall-bladder disease, it cannot be entirely relied upon either for diagnosis or prognostic purposes following cholecystectomy.

Kunath expresses the opinion which other investigators before him, notably Burden, Sanders, Judd, Palmer, Graham, and Mackey, have expressed; i.e., that an analysis of pre-operative symptoms is probably of greater value in estimating the probable benefits to be derived from cholecystectomy than the cholecystographic evidence or the pathological report. The trend now is to regard the presence of definite biliary colic as the most dependable indication for cholecystectomy, as well as the symptom most likely to be relieved by this means. Eighty-six per cent of the patients with colic under investigation were cured. Of the cases in which vague dyspeptic symptoms were present prior to operation, only 33 per cent were cured. Moreover, the dyspepsia syndrome developed postoperatively in 38 per cent of the cases in which it was absent preoperatively. Observations such as these seem to favor the view that the dyspepsia syndrome is more closely related to non-function of the gall bladder than to disease of the gall bladder.

Kunath believes that the majority of the cases which showed no improvement must be explained on a basis of physiological change or altered function. He ventures the opinion that there probably is a large group in every series of non-calculous gall bladders lying on the borderline between organic and functional disease. It is difficult to diagnose these cases and the results after cholecystectomy are apt to be disappointing. A better understanding of the physiology of the biliary tract will doubtless help to remove much of the doubt and disappointment that are now so frequent in the treatment of the non-calculous gall bladder. MATHIAS J. SEIFERT, M.D.

**Cooper, W. A.: Carcinoma of the Gall Bladder.** *Arch. Surg.*, 1937, 35: 431.

The author presents a comprehensive study of 48 cases of carcinoma of the gall bladder observed at the New York Hospital, New York City, in the period from 1915 to 1935. In addition, he gives a brief historical résumé of the subject.

The apparent increase in the frequency of carcinoma of the gall bladder roughly parallels the increase in frequency of operations on the gall bladder. In 1,500 operations on the gall bladder, the surgical incidence of carcinoma was 3 per cent, while the autopsy incidence was 0.61 per cent in 2,941 cases.

Most of the patients were between the ages of fifty and sixty years, and it was noted that inflammatory disease of the gall bladder was most common between the ages of forty and fifty years. Seventy-seven per cent of the patients were women, which is in agreement with other reports, the ratio being, roughly, 4 women to 1 man.

Of the various etiological factors, chronic irritation incident to cholelithiasis and infection is the most constant finding. Stones were found in 79 per cent of the patients, and 48 per cent gave a history of colic of long duration. Malignant degeneration of benign papillomas of the gall bladder is also possible.

Pathologically, the disease may be divided into 2 groups: adenocarcinoma and squamous carcinoma. The former group is subdivided into: (a) papillary

adenocarcinoma, 12 per cent, (b) infiltrating adenocarcinoma, 56 per cent, (c) scirrhous adenocarcinoma, 25 per cent, and (d) mucous adenocarcinoma, 12 per cent.

Inflammation and chronic mechanical irritation produce a variety of reactions in the gall bladder, and the type of reaction seems to determine to some degree the type of lesion formed. If the submucosa is more responsive than the mucosa, the resulting papilloma may be composed chiefly of connective-tissue elements covered with epithelium. Should the response be an overgrowth of epithelium, simple benign papillomas develop.

The appearance of squamous-cell carcinoma in the gall bladder is explained on the basis of metaplasia. One example was seen in the present series. Clinically, this type may resemble scirrhous adenocarcinoma.

Carcinoma may occur in any portion of the epithelium of the gall bladder, but it is estimated that from 80 to 90 per cent originates in the fourth of the mucosal area represented by the dome and neck of the gall bladder. This distribution again suggests the importance of calculi as an etiological factor. The site of the tumor obviously influences the course of the disease and clinical picture.

In general, carcinoma of the gall bladder disseminates by local extension, lymphatic metastases, and blood-borne metastases. Local extension is by far the most common method of spread, and the liver is involved earlier and more frequently than any other organ.

In 52 per cent of the patients, there was a history of gall-bladder disease of long standing, and in 70 per cent of those in which no such history was elicited, stones were found. After the onset of carcinoma, the clinical course is usually modified by symptoms referable to the tumor and its growth. The symptoms and signs, and their incidence in this series is as follows: pain in 69 per cent, loss of weight in 95 per cent, anorexia in 85 per cent, tenderness in 73 per cent, a palpable mass in 50 per cent, a palpable edge of liver in 50 per cent, jaundice in 48 per cent, and vomiting in 45 per cent. Leucocytosis, anemia, and chills and fever occurred less frequently. There were 7 atypical cases. Four of the patients had symptoms of obstruction of the common duct, 2 presented duodenal obstruction, and 1 had a condition which resembled hydrops of the gall bladder.

The diagnosis of carcinoma of the gall bladder is difficult to establish with certainty. A constant dull aching pain in the epigastrium or right upper quadrant, persisting over a period of weeks, is one of the most valuable features in the differential diagnosis. Cholecystograms are seldom said to be of aid. In 17 cases in which cholecystograms were made, a positive diagnosis of carcinoma of the gall bladder was not made by roentgen examination.

The results of treatment are not encouraging. Operations which consisted of exploratory laparotomy with removal of tissue for biopsy, cholecystectomy, cholecystostomy, and gastro-enterostomy were performed in 45 cases. Five patients were free of metastases at operation. One patient who was known to be alive and well two years following operation was subsequently lost from observation. The remainder succumbed at operation or shortly thereafter.

The author agrees with Graham that the most rational attack on this disease is its prevention by early removal of the gall bladder in all cases of cholelithiasis. JOHN A. GIUS, M.D.

**McCaughan, J. M., and Sinner, B. L.: Pancreatic Fistula: Its Medical and Surgical Management.** *Arch. Surg.*, 1937, 35: 449.

External fistula of the pancreas may be classified as either complete or incomplete. The former must be exceedingly rare, as the greater number of reports encountered in the literature deal with external fistula of the incomplete variety in which there is only a partial loss of pancreatic juice. Fistula of the pancreas arises in various ways:

1. Following a drainage operation on the pancreas for an acute inflammatory condition.
2. Rarely, as a result of a stab or gunshot wound of the abdomen.
3. From injury to the pancreas in operations on the kidneys, stomach and duodenum, biliary tract, spleen, retroperitoneal tumors, and adrenal glands.
4. After partial resection of the pancreas, or excision of an islet-cell tumor for the relief of hyperinsulinism.
5. Following operation for calculi of the pancreatic duct.
6. Most commonly, after an attempt to extirpate a cyst of the pancreas.

The recognition of uncomplicated pancreatic fistula is not difficult; it is established by means of examination of the fluid for its reaction and its enzyme content. Duodenal fistula may be differentiated by the additional presence of bile and by the erosion of the margins of the wound.

The treatment of external pancreatic fistula is complicated first by the necessity of restoring pancreatic juice to the body in sufficient quantity and before serious physiological disturbances have taken place. Secondarily, treatment is concerned with the attempts at closure of the fistulous tract. Conservative means should always be adopted in the beginning.

The authors review the literature which deals with the various forms of medical treatment employed. They believe that if these measures fail after a reasonable trial period, radical treatment should then be considered. The operative procedure, the technique of which is described in a case report, consists essentially of mobilization of the fistulous tract and its implantation into the nearest portion of the upper gastro-intestinal tract, preferably the stomach. The entrance of pancreatic juice into the stomach does not seem to have any deleterious effect on gastric digestion.

The authors report in detail a case of incomplete pancreatic fistula following a Billroth II gastrectomy for neoplasm of the stomach. Conservative treatment over a period of eight or nine months had failed to effect a closure of the fistula, or any significant diminution in the discharge from the fistula. They were able to inhibit or excite the flow with a number of drugs and food substances, but they question whether these effects could be maintained over long periods of time. High voltage roentgen therapy had proved unsuccessful in a previous case and so was not again attempted.

Operation consisted in the mobilization of the fibrous fistulous tract, including a cuff of skin about the external opening. The tract was inserted into the stomach through an opening in the anterior wall. The tract was not stitched to the stomach wall, but was held in place, without tension, by the cuff of skin and the sutures closing the gastric opening, in addition to which omental tags were sutured over the site of implantation. The authors warn against angulations or constriction of the tract in order to prevent reduction and cyst formation. There was a postoperative leak of gastric and pancreatic juice for about seventy-two hours. This, however, cleared up completely, and the wound was entirely healed at the end of four weeks. The patient rapidly regained weight and strength.

Postoperative gastric analysis revealed the gastric contents to possess definite lipolytic activity. The degree of acidity, as compared with that before operation, was considerably lower. The authors believe this to be due to the fact that the principal acid-forming area of the stomach was unable to compensate in the usual manner. Blood diastase was normal.

JOHN H. GARLOCK, M.D.

## MISCELLANEOUS

**Reinking, J. J.: Ultraviolet Irradiation during Operations by the Method of Havlicek** (Bestrahlung waehrend der Operation mit Ultraviolett nach Havlicek). *Zentralbl. f. Chir.*, 1937, p. 1579.

Interested by Havlicek's work on circulation, peritonitis, and thrombosis, the author visited him to see his control laboratory experiments, to learn the theoretical backgrounds, and, particularly, to observe the immediate mobilization of surgical patients. For the past year, all patients were irradiated with ultraviolet rays during operation. Reinking carefully observed Havlicek's directions. No drastic cathartics nor large enemas were used, in order to prevent activity of the empty intestinal loops and pendular peristalsis. Morphine and other alkaloids were also unnecessary because the patients no longer suffered from after-pains. Inhalation anesthesias with ether and chloroform were avoided particularly in favor of local anesthesia, as the patients stood up immediately after the operation. Furthermore, the liver, which is the most important detoxifying organ in peritonitis, was not damaged. There was no postoperative vomiting. If local anesthesia was inadequate, Braun's splanchnic anesthesia was added. The avoidance of general anesthesia led to careful and gentle operating. The operation should not be done mechanically. The operating room personnel should be well trained and familiar with every necessary procedure.

Collapse did not occur in irradiated patients; on the contrary the threat of collapse was avoided by the irradiation. The Biosol-A lamp of Philips of Holland was used for the irradiation, which lamp is cheaper than the original of Havlicek and produces the same results if Havlicek's original filter is used. By irradiation, the arteriovenous short circuits are opened, as can be seen from the fresh red color of bowel or omentum that have been exposed to the rays for some time. The circulatory rate and, therefore, the blood pressure in the portal system are increased. Postoperative meteorism is also a circulatory problem. The circulation is improved by irradiation and meteorism is avoided. On the other hand, peristalsis is stimulated and the danger of intestinal paresis is removed. The patients feel refreshed after the irradiation. The alkali reserve of the blood is increased. One must avoid over-irradiation which may cause a severe alkalosis with excitation and motor unrest and, occasionally, convulsions with clouding of the consciousness. The patients in such cases recover with acidification. The author has had 3 patients with such complications, all of whom recovered. The immediate arising from the operating table brings the bowel loops and omentum into their natural position at once, without the delay which follows if peristalsis is expected to accomplish this. Abdominal binders are not necessary; a local dressing with adhesive is sufficient.

(BODE). LEO M. ZIMMERMAN, M.D.

# GYNECOLOGY

## UTERUS

**Strachan, G. I.: The Precancerous Cervix.** *J. Obst. & Gynaec. Brit. Emp.*, 1937, 44: 625.

The author defines a precancerous condition as a pathological condition of the tissues which is likely to develop into cancer. The objective of this report is to indicate pathological features which show that in a particular instance there was at least a probability of the lesion present becoming carcinomatous. Since no one has ever observed a cell in the process of acquiring malignant properties, inference and deduction must figure prominently in considerations of the problem. This communication is based on the clinical and histological investigations of several hundred cervices removed mainly because of chronic inflammatory lesions. In a small proportion, early carcinoma was found unexpectedly. The examination of 400 cases of true cervical carcinoma has been of corroborative value.

The main clinical precancerous cervical lesion is produced by the various effects of chronic infection, usually secondary to obstetrical trauma. Although a large variety of appearances is seen in the microscopic examination of chronically infected cervices, the author herein considers changes regarded as predisposing to carcinoma in (1) the stroma, (2) the epithelium, and (3) the blood vessels.

The main connective-tissue lesion appearing to predispose to carcinoma formation in the cervix is subepithelial hyaline degeneration, seen only in long-standing cases. In studying the epithelial appearances in chronic cervicitis which may be regarded as precancerous, one suspicious feature is a separated clump of surface epithelial cells in the tissue. Another is the type of interpapillary downgrowths. These are usually of irregular disposition and depth, but in shape they are blunt-nosed; at times this appearance is altered and the cell columns are seen to be rather sharply pointed and of a penetrative appearance.

In the glandular tissue of the cervical canal the main change regarded as precancerous is a tendency for the glands to lose their racemose appearance and to revert to a simpler tubular type. This would represent a degree of metaplasia of the gland as a whole, and not of the epithelium lining it.

It is in the germinal layer that the earliest signs of carcinoma are seen. Careful examination of several sections of a particular specimen is called for in estimating the presence of precancerous changes of the cells. Of the constituent cells, those of abnormal size and shape should be studied for other characteristics of malignancy. In a non-malignant squamous epithelial cell the cytoplasm is evenly stained, but in a carcinoma cell the stain is absorbed quite unevenly, producing a mottled appearance. This characteristic, especially in the presence of mitotic figures, indicates a tendency to carcinoma formation. A hyperchromatic appearance in a squamous epithelial cell, particularly if in a number of adjacent cells, and if associated with irregular staining and mitotic figures in the nucleus, indicates the probability that the cells are acquiring malignant properties Mitotic figures in a number of cells indicate the actual presence of carcinoma, but if limited to a cell or two with surrounding and intervening cells, they indicate a precarcinomatous disposition. The size of the nucleus should be studied with care. In an isolated cell or two a nucleus larger than those in adjacent cells would indicate a tendency on the part of such a cell to become malignant.

The relation of the cells to the basement membrane has been studied. Carcinoma may be present before any penetration of the membrane is to be seen, but actual penetration of the basement membrane is a definite sign of malignancy. The view that metaplasia of the squamous epithelium, as the result of long continued irritation, may be responsible for some of these appearances of the adenomatous nature of chronic cervicitis, has been rather neglected. If the area of an erosion is examined at the junction of the squamous and columnar epithelium, many clumps of cells may be seen of an indeterminate appearance with, in some cases, a tendency to giant-cell formation so that it is impossible to determine their exact origin from squamous or from columnar epithelium. This appearance, being due to prolonged irritation and representing a reversion to an undifferentiated and embryonic condition of the cell, suggests that the undifferentiated cells may at any time become carcinomatous.

The author, in summarizing, notes that precancerous changes are limited to a few isolated cells, and in a particular cell the changes should be few. Thus, if a cell were to show nuclear mitosis, hyperchromatism, and increased relative and absolute size of the nucleus and nucleolus, the probability is that it is already carcinomatous and further search would probably confirm this by demonstrating similar changes in adjacent cells. Although it might be deduced that precancerous signs are numerous and easily identified, the reverse is the case, so that much tedious work with little tangible result is entailed in the search for the cervical precancerous lesion. The practical importance of this matter does not need any stressing. If cervical cellular changes which are not yet carcinomatous but are likely to proceed in that direction can be identified, a minor operation, such as amputation of the cervix, would save the patient from the terrors of carcinoma and represent prophylactic gynecology in the best sense. For this reason alone, the author is of the opinion that this matter requires further investigation until a better understanding has been attained.

HERBERT F. THURSTON, M.D.

**Mathey-Cornat, M. R.: External Roentgenotherapy (Transabdominal) as the First Stage in the Treatment of Cervico-Uterine Carcinoma** (De la roentgenthérapie par voie externe—transabdominale—comme premier temps du traitement du cancer cervico-utérin). *Presse méd.*, Par., 1937, 45: 1243.

Mathey-Cornat believes that in the majority of the cases fractionated external roentgen irradiation must precede intracavitary radium treatment or intravaginal direct roentgenotherapy.

For the external transcutaneous irradiation the author prefers to give 300 kv. because the treatment is conducted with greater ease and the dose is better tolerated by the patient. The author prescribes an intensity of 10 roentgen min., a focal distance of 80 cm. or eventually 1 mm. The dose per field can be raised to 3,500 roentgens, the deep dose reaching a minimum of 4,000 roentgens.

The initial external irradiation is continued to about the middle of the treatment; i.e., about one-half of the total dose is given at about the twentieth or twenty-fifth day. The patient is carefully watched, the regressive changes of the lesion are observed, and as soon as the neck of the uterus is permeable, utero-vaginal intracavitary radiumtherapy is immediately instituted. If no improvement follows, however, the external irradiation is continued until the entire dose has been given, and then radium therapy is instituted. The roentgen-radium treatment usually requires several weeks. It may have to be interrupted occasionally for a few days to give the patient rest and medical treatment, such as the administration of glucose serum and insulin.

Aside from a few disadvantages, preliminary external roentgen irradiation is better tolerated by patients who when first seen are emaciated, anemic, and have a very low resistance. It does not cause shock as is observed in intracavitary radium treatment. Following the first few roentgen treatments the patient feels relieved, the appetite improves, sleep is quieter, the hemoglobin rises, and the arterial tension is increased. The chances of infection are decreased.

Locally external preliminary irradiation causes favorable changes in the neck of the uterus, the neoplastic lesions become aseptic, the vagina is cleansed, and the tumor is reduced in size. The uterus becomes more movable without manipulation and without the aid of surgical procedures in which lymphatics are opened.

The most important and valuable result of preliminary x-ray treatment is the restoration of the permeability of the neck of the uterus. The favorable action of this treatment is especially marked for malignancies which are classified as of the second or third degree.

The author has treated in this fashion a total of 316 cases which he followed up from 1932 to 1935. In from 48 to 49 per cent of the early cases the results were favorable. In advanced cases the results obtained were satisfactory in from 40 to 41 per cent of the patients. The total percentage of cases treated successfully by means of this method was from 44 to 45 per cent.

The combined roentgen-radium treatment, as outlined above, requires a hospitalization of several weeks. Of course, the treatment may be modified from case to case. RICHARD E. SOMMA, M.D.

**Moulonguet, P., and Gasne, L.: Diagnosis of Carcinoma of the Body of the Uterus** (Diagnostic du cancer du corps de l'utérus). *Gynécologie*, 1937, 36: 387.

Moulonguet and Gasne state that the diagnosis of carcinoma of the body of the uterus is usually made in a woman who, several years past her menopause, suddenly begins to bleed vaginally. This bleeding is also usually accompanied by pain in the abdomen.

This diagnosis, however, presents great difficulties in certain cases because of the fact that the symptoms are not strictly pathognomonic of carcinoma of the uterus. In fact, this malignant condition may manifest itself under a great variety of clinical signs.

In the first place, the authors point out that a metrorrhagia appearing soon after cessation of the menses is not at all indicative of a malignancy because it may be due to:

1. Medical causes: the result of a hemorrhagic syndrome, or it may occur in the course of a myocardial insufficiency.

2. A so-called infectious metrorrhagia, now known to be due to an atresia of the cervical canal with distention of the uterine cavity, accompanied sometimes by a pyometritis. Certain polyps involving the neck of the uterus may also arise on an infectious basis.

3. Procidentia. This may also be a cause of metrorrhagia in elderly women.

4. The development of an ovarian tumor. In these cases the diagnosis is especially difficult. Among these tumors, the folliculoma is perhaps the most important. This neoplasm produces sufficient folliculin to cause periodic or irregular bleeding. These hemorrhages may be profuse and may be believed to be due to carcinoma of the body of the uterus. Being of small volume, these tumors usually escape detection even with a most careful gynecological examination.

The authors state that in general any ovarian tumor, whether benign or malignant, whether of endocrine or non-endocrine character, may give rise to metrorrhagia after the menopause and may, consequently, be easily confused with carcinoma of the body of the uterus.

Concerning carcinoma of the body of the uterus occurring before the menopause, the authors state that clinically these cases are characterized by a metrorrhagia which does not present any special features. The problem is further complicated by the fact that in relatively many cases, fibroids of the uterus are complicated by a carcinoma of the endometrium. It has been demonstrated that a fibromyomatous nucleus predisposes the endometrium

to carcinomatous degeneration. It is for this reason that surgical treatment of fibroids is the method of choice inasmuch as epitheliomas of the body of the uterus are highly resistant to irradiation. Indeed, in reviewing the literature the authors have found many reports of a rapidly developing carcinoma of the cervical stump following hysterectomy for fibroids, or of a rapidly developing carcinoma of the uterus extending into the pelvic cavity following radium therapy for the treatment of fibroids.

In the opinion of the authors it is therefore essential that in any subtotal hysterectomy the surgeon inspect the uterine cavity for the presence of carcinomatous changes. In their presence, he should remove also the remaining stump. In certain gynecological conditions it is also necessary, before administering roentgen irradiation, to rule out the possibility of a malignancy involving the uterine mucosa by simple means, such as hysterography or a diagnostic curettage.

Other conditions clinically producing a metrorrhagia and easily confusable with a malignancy are endometrial hyperplasia, or functional metrorrhagia, and uterine polyps, which may or may not coexist with a carcinoma. In the presence of a polyp of the neck of the uterus in an elderly woman a carcinoma should always be suspected, and the diagnosis should be confirmed by means of a diagnostic curettage.

The authors finally discuss carcinomas involving both the neck and body of the uterus. The diagnosis is usually made by careful gynecological examination. The carcinomatous changes involve the neck as well as the body of the uterus, and large infiltrated ligaments are present. Carcinomatous changes can be demonstrated in the uterus following diagnostic curettage. In operable cases Wertheim's operation preceded by radium treatment is probably the method of choice. The preliminary administration of radium is of great value because the subsequent hysterectomy may be performed in one step. RICHARD E. SOMMA, M.D.

## ADNEXAL AND PERIUTERINE CONDITIONS

**Glasunow, M.: The Histology and Histogenesis of the So-Called Cilio-Epithelial (Serous) Cystomas of the Ovaries** (Histologie und Histogenese der sogenannten cilioepithelialen (seroesen) Cystome der Ovarien). *Arch. f. Gynaek.*, 1937, 164: 358.

The author has studied the epithelium of cilio-epithelial ovarian cystomas and concludes that this epithelium, although quite diverse in form, is uniform in character. According to his view, it presents such marked similarities to the various characteristics of the tubal epithelium that an identity must be considered.

He believes, therefore, that three possibilities must be accepted for the derivation of cilio-epithelial cystomas; they are derived from (1) the investing epithelium of the ovary with a differentiation toward the epithelium of the tube, (2) the embryonal rests of the Muellerian epithelium in the ovary, and (3) implants of the tubo-uterine epithelium. He proposes, therefore, to designate cilio-epithelial cystomas as tubo-epithelial cystomas or Muellerian cystomas.

Further investigations showed him that the epithelium of the cilio-epithelial cystomas is also able to secrete mucus. The epithelium of the tubes is also able to form mucus to the same extent as the cells of the cilio-epithelial cystomas. He believes therefore that some of the pseudomucinous cystomas are only functional varieties of the cilio-epithelial cystomas; that one cannot distinguish, at present, which of the pseudomucinous cystomas have a teratomatous or non-teratomatous character.

(FAUVET). J. M. SALMON, M.D.

**Kahr, H.: When Is a Bilateral Ovariectomy Indicated in Unilateral Ovarian Tumors?** (Wann ist bei einseitiger Ovarialgeschwulst die Entfernung beider Ovarien angezeigt?) *Wien. klin. Wchnschr.*, 1937, 2: 1083.

The problem why in some ovarian tumors both ovaries become affected, is not yet solved. In the primary ovarian carcinoma we assume that the neoplasm develops bilaterally on the basis of the similar receptivity in both germinal glands. The metastatic ovarian carcinomas, which are nearly always bilateral, are the result of retrograde lymphatic transport from the carcinomatous lymphatic glands of the retroperitoneal cavity which receive the cancer particles from the primary cancer of the stomach, bowel, or gall bladder. The decision when both ovaries should be excised in cases of ovarian blastomas, cannot be made definitely. Evidently excision is indicated as a matter of principle, in order that the sections of the excised tumor can be studied thoroughly in every ovariectomy. If there is a doubt as to the results, a section of the frozen tissue under the microscope will give a definite diagnosis. The author believes that this procedure ought to be used more frequently. When this is not feasible, a section of the healthy appearing ovary should be examined. If this section appears to be normal, a few stitches will suffice to control the insignificant hemorrhage.

All the proliferating ovarian tumors are classified by the author in a very comprehensive table. The stromatogenous, the epithelial, and the teratoid tumors are separated into distinct classes. The ovarian fibromas are bilateral in 14 per cent of all the cases. Although ascites is frequently encountered, the healthy ovary may be left *in situ* if the affected ovary contains a benign tumor. In the sarcomas the percentage is essentially higher (35 per cent). Despite the malignancy of sarcoma, a unilateral ovariectomy may be risked in children and very young women, provided the tumor is limited within an intact capsule. In cystadenoma pseudomucinosum, which is bilateral in 6 per cent of the cases, a unilateral operation is sufficient up to forty years of age.

In papillary cystadenoma cilio-epitheliale serosum both ovaries are involved in 50 per cent of the cases. In view of the frequency of malignant degeneration,

castration should be done at thirty-five, the latest at forty years of age. If the cysts are ruptured, hysterectomy should also be done at the same time. For the fibro-adenoma cysticum, which is nearly always unilateral, as well as for tumors of the Brenner type, the excision of the affected ovary is sufficient.

In all the cases of benign blastoma discussed, the uterus should be left *in situ* even though both ovaries must be excised. The dangers arising from the functionless uterus are so insignificant, that the more serious extirpation of this organ is justifiable only if technical causes, such as the necessity for drainage, or special indications, as ruptured cysts in cystadenoma serosum, are present.

In carcinomas arising from the cystadenoma pseudomucinosum, which are bilateral in 6 per cent of the cases, and in carcinomas from the cystadenoma cilio-epitheliale serosum, which are bilateral in from 40 to 50 per cent of the cases, radical surgery is the only therapy to be considered. In dysgerminomas, which are usually unilateral, the healthy ovary may be left in children and women between twenty and thirty years of age if the tumors are still in a firm capsule. In metastatic ovarian carcinoma the extirpation of the uterus together with both ovaries is the only procedure to be considered. The last group of the epithelial tumors includes the very interesting endocrine-active tumors, especially the granular-cell tumors, which are bilateral in 7 per cent of the cases; the arrhenoblastomas, mostly bilateral; and the hypernephroid tumors, also mostly bilateral. Although the granular-cell tumors are histologically malignant, clinically they may be regarded as comparatively benign; therefore, in children and young women the healthy ovary may be left intact. For the arrhenoblastomas or masculinizing tumors, the simple ovariotomy is fully justifiable. For hypernephroid tumors definite advice cannot be given as they are very rare. The last group, teratoid tumors, includes the dermoid cysts, the teratoblastomas, and the ovarian strumas. The dermoids are bilateral in 13 per cent of all cases. As they are benign and only one ovary is affected, the extirpation of the tumor is sufficient. If bilateral and occurring in young women, the blastomatous tissue should be carefully dissected out of the ovarian substance. After this procedure not only the menses but also labor was observed to occur. In the malignant teratoblastomas, which are nearly always unilateral, even the radical operation is seldom successful. In ovarian strumas the unilateral ovariectomy is always sufficient.

(Hans Heidler). Mathias J. Seifert, M.D.

## EXTERNAL GENITALIA

**Vayssière, E.: The Etiology and Medical Treatment of Pruritus Vulvæ** (Aperçu étiologique et traitement médical du prurit vulvaire). *Gynéc. et obst.*, 1937, 36: 209.

Vayssière discusses the etiology and treatment of pruritus vulvæ on the basis of his own clinical experience and the replies to his questionnaire sent to a number of French gynecologists. The incidence of pruritus vulvæ in gynecological and obstetrical practice varies from 5 to 10 per cent. The author's own statistics indicate that it occurs in 7.5 per cent of gynecological patients and in 10 per cent of pregnant women.

The causes of pruritus vulvæ are numerous. Many excretions and secretions, not only from the anus, the urethra, and the cervicovaginal canal, but also from numerous sweat and sebaceous glands, the Bartholin glands, the periurethral glands, and Skene's glands, come in contact with the vulva. If any one of these excretions or secretions becomes infected or pathologically altered so as to be irritating, it may be the cause of irritation and pruritus of the vulva, especially of the internal surface of the labia majora and the clitoris. Among such local causes, leucorrhea is of chief importance, and this fact is often recognized by the patient herself. The use of irritating soaps and caustics and prolonged sitz baths may also be the cause of pruritus vulvæ. In cases in which no local cause can be discovered, the cause of the pruritus may be an infection confined to a gland or a very small area. The author has found that the pruritus of pregnancy is often due to an infection with monilia albicans; this infection is associated with pregnancy particularly because the characteristic hypersecretion of the cervical glands furnishes a particularly favorable medium for the growth of the monilia. Trichomonas vaginalis infection, a frequent cause of leucorrhea in non-pregnant women and also occurring in pregnancy, may cause a severe pruritus vulvæ. Infections of the rectum, of the bladder, and of the uterine adnexa may also produce pathological changes in the excretions and secretions which come in contact with the vulva, thus causing pruritus.

Various general conditions and diseases, toxemias and endocrine disturbances, especially, may be the cause of pruritus vulvæ; chief among these are icterus, albuminuria, and diabetes mellitus. Recent studies of the female sex hormones have shown that pruritus vulvæ may be associated with ovarian dysfunction and particularly with deficiency of the follicular hormone. The author, at one time skeptical in regard to the hormonal origin of pruritus vulvæ, has become convinced from his study of 190 cases that the so-called "essential pruritus" is usually of hormonal origin. In these 190 cases there were 56 without menstrual disturbances; of these there were 28 with pathological leucorrhea, which was due to various bacterial and mycotic infections, cervicitis, and cervical polyps; 15 with infections of the vestibule, i.e., of the urethra, Bartholin's and Skene's glands, and the bladder; 1 with a uterine fibroma; 5 with intertrigo, herpes or other dermatosis, or rectitis; and 7 in which the cause was not determined because of incomplete study. There were 7 diabetic patients and 61 pregnant women, 45 of whom had an infection with trichomonas or monilia or both. There were 35 patients with definite evidence of ovarian dysfunction and 31 in the physiological or surgical

menopause; a number of the patients also had some local infection.

The treatment of pruritus vulvæ must depend upon the cause. When the cause is purely local, local applications in various forms are indicated. The author does not favor the use of alkaline soaps; the use of various oils or soaps medicated with acids is preferable for cleansing and bathing. If sitz baths are employed they should be cool, or only slightly warm, and acidified. Douche baths are preferable to sitz baths, the author believes; these also should be cool, or only slightly warmed. When the cause of pruritus vulvæ is a cervicovaginal infection, vaginal injections are indicated. Among the many drugs advocated for these vaginal injections, the author has found silver nitrate in weak solution, 1 : 2,000, most valuable; the dilution used has a pH of approximately 6.5. The injections are given daily in such a way that the vulva is also bathed with the solution. Experiments have shown that silver nitrate in dilutions weaker than that employed therapeutically destroys both bacteria and fungi in culture. In some cases vaginal suppositories may be employed; in trichomonas infection, the author has found stovarsol of value.

Various lotions, powders, and topical applications are employed for the local treatment of pruritus vulvæ. For the immediate relief of the pruritus the use of a solution containing chloral hydrate and carbolic acid, applied as a cold compress, is often of value. For topical application the author uses silver nitrate in a 1 to 15 concentration; in some cases he uses some of the modern dye preparations, especially gentian violet in a 1 per cent solution containing glycerine. Various forms of electrotherapy and the infra-red rays have been used in the treatment of pruritus vulvæ, but the author has had no personal experience with them. The x-rays in small, moderately penetrating doses have been employed in some cases which were resistant to all other forms of treatment; the author is of the opinion that radiotherapy is indicated only in the exceptional case.

In cases where the pruritus is associated with some general condition, the chief factor in its treatment is the relief of this condition. In diabetes the pruritus often disappears when the diabetes is well controlled. In some cases supplementary local treatment is indicated. In patients with marked nervous irritability, the use of sedatives and psychotherapy is indicated. Some authors advise the use of desensitization treatment in pruritus vulvæ; in some cases autohemotherapy gives good results. In syphilitic cases, antisyphilitic treatment is indicated.

Hormonal therapy is indicated in cases in which there is evidence of deficiency of the follicular hormone, i.e., in cases of amenorrhea or oligomenorrhea, or in the menopause, whether physiological or artificial. The folliculin preparation is given usually by subcutaneous or intramuscular injection in doses of 3,000 to 50,000 international units weekly. The hormone may be given by mouth, but as it is less active by this method, it must be given in larger doses. Administration by mouth is indicated especially when hormonal therapy is used only as an adjunct to other therapy, or as a method of continuing treatment after a series of injection treatments. Some gynecologists employ local applications of folliculin in an ointment. If folliculin is given in sufficiently large doses and treatment continued for two months or more, good results are obtained not only in the relief of pruritus, but also in improvement of other conditions. ALICE M. MEYERS.

**Cotte, G.: The Surgical Treatment of Pruritus Vulvæ** (Traitement chirurgical du prurit vulvaire). *Gynéc. et obst.*, 1937, 36: 257.

Cotte notes that only exceptional cases of pruritus vulvæ which are resistant to all methods of medical treatment require operation. He has operated in only 5 cases, although he has treated a number of cases of pruritus vulvæ, as have most gynecologists. These 5 cases were not from his own practice but were referred to him by dermatologists who had employed many methods of treatment without result.

Provided that all local causes for pruritus vulvæ have been ruled out, and that there is no pelvic disease that may be the causative factor, surgical treatment may be indicated when all other methods have failed and the pruritus is severe. Partial vulvectomy may be done if the vulvar lesion is well localized. In aged women a total vulvectomy may be done if there is no associated kraurosis. As a rule, the pruritus without evident local cause is a trophic condition, and operation on the sympathetic nervous system is indicated for its relief if surgical measures become necessary.

The operations most frequently proposed for pruritus vulvæ are resection of the internal pudic nerve, resection of the presacral nerve, and periarterial sympathectomy. The pudic nerve contains many sympathetic fibers, and also some sensory fibers belonging to the cerebrospinal nervous system. If the pudic nerve is sectioned above the point where it divides, an anesthesia of the clitoris results; yet it must be sectioned above this division if the operation is to give relief from pruritus vulvæ. Hence the author is of the opinion that this operation should be employed only if the woman has ceased all sexual activity.

The author prefers resection of the presacral nerve in every case in which there is no contra-indication to laparotomy. This operation does not interfere with the sexual functions. Also it makes it possible to detect any pelvic lesion which may not have been found by clinical examination, but which might be the cause of recurrence of the pruritus. This operation involves practically no risk. The author performed resection of the presacral nerve in the 5 cases of pruritus vulvæ in which he operated. Of these, 2 were completely cured, 2 improved, and 1 was unimproved. The latter was subsequently cured by a secondary operation for resection of the internal pudic nerve. The author is of the opinion, as indicated by the case cited, that a combination of opera-

tions may give the best results in pruritus vulvæ. Procedures that may be necessary are: vulvectomy and resection of the internal pudic nerve, resection of the presacral nerve with hypogastric periarterial sympathectomy, and section of the superior hemorrhoidal plexus. If the laparotomy shows the presence of a pelvic lesion, this should be treated even if its relation to the pruritus is not evident. In regard to the resection of the internal pudic nerve, it seems best to reserve this as a second operation for the cases in which pelvic sympathectomy does not give complete relief. The fact that the perineum and the vulva have a double sympathetic nerve supply, by way of the hypogastric ganglion and by way of the internal pudic nerve, or the periarterial plexus of the hypogastric artery, may make it necessary to operate on the nervous fibers of both routes. It may be advisable to supplement the operative treatment by a desensitization treatment to consolidate the results.

ALICE M. MEYERS.

**Medina, J.: Surgery of Carcinoma of the Vulva** (A cirurgia do carcinoma da vulva). *Ann. brasil. de gynec.*, 1937, 2: 117.

Medina states that in carcinoma of the vulva as well as in carcinoma of the cervix it is primarily important to remove the cellular connective tissue through which the lymphatics pass, but futile to hunt for invaded glands. In cancer of the vulva no studies have as yet been made which are analogous to those made in cancer of the cervix, as to the percentage of cases in which collections of tumor cells occur in the perivulvar connective tissue. In vulvectomy only the superficial and deep inguinal glands should be removed, which is an easy procedure and does not increase the gravity of the operation. Removal of the iliac and hypogastric chains should be attempted only in exceptionally favorable cases, although the iliac glands should be investigated in carcinoma of the clitoris. These principles are logical because the lymphatics of one section of the vulva, Bartholin's gland, drain into the anorectal glands, and also because recurrences are almost always situated in the scar and not in the glands.

The author describes the distribution of the vulvar lymphatics and outlines Peham and Amreich's operation, with illustrations. M. E. MORSE, M.D.

**Goebel, A., and Hamann, A.: The Clinic and the Therapy of Carcinoma of the External Genitalia. I. The Clinic and the Therapy of Vulvar Carcinoma** (Zur Klinik und Therapie der Carcinome am aeusseren Genitale. I. Mitt. Zur Klinik und Therapie des Vulvacarcinoms). *Zentralbl. f. Gynaek.*, 1937, p. 1394.

For more than a period of seven years the departments of gynecology and actinotherapy of the St. George General Hospital in Hamburg have held weekly conferences to decide upon the treatment of their patients with gynecological carcinoma. The coöperation of the surgeon and the actinotherapist and the after-care of the patient are considered very important. During the period from July 1, 1915 to Nov. 1, 1936 there were admitted 69 patients with vulvar carcinoma. This amounted to a frequency of carcinoma of the external genitalia in 0.7 per cent of the total number, and 2.4 per cent of the gynecological carcinomas. Of these 69 cases 8 were recurrences, hence, only 61 cases could be considered in this series; of these, 38 were under observation longer than five years, and 23 for a shorter period. The average age of the 61 patients was sixty-two years, the extremes being thirty-six and eighty-eight years. Kraurosis vulvæ was diagnosed only 3 times, leucoplakia only twice, condyloma and papilloma each only once as early stages of a subsequent vulvar carcinoma. The labia majora were most frequently involved; the carcinoma was bilateral in 23 patients; this is significant as carcinoma in the region of the urethra and of the clitoris usually had extended to both labia.

Surgical therapy was given in 12 cases; surgery and actinotherapy in 40; actinotherapy in 4; and symptomatic treatment in 5. The operative technique depended upon the site involved; the carcinoma was widely encircled by a funnel-shaped incision with the electric cautery either singly or bilaterally, and the carcinomatous tissue lifted out of its bed. In 16 patients, the inguinal lymph glands were excised. A sharp scalpel was used and the operation was limited to scraping out the débris from the superficially located lymph glands which often were found to be already broken down. Of the 52 patients with vulvar carcinomas that were treated surgically, 2 died of lung embolisms.

Five to six weeks after diathermic cauterization, according to the method of coöperative treatment, the prophylactic roentgen-ray exposures were applied to the inguinal glands. For each side from 4 to 8 sub-divisions of the entire dosage were given, which was equivalent to a massive dose of from 1,600 to 2,400 roentgens in from nine to nineteen days. When the glands were excised the roentgen treatment was given from three to four weeks later, in the same manner as described.

Inoperable gland-tumors were treated according to their extensiveness, with radium needles, radium distant moulage, or protracted fractional roentgen therapy, with a high total dosage of from twelve to fifteen times 300 roentgens. A postoperative roentgen treatment of the vulva was undertaken only when the operation could not be done radically in a healthy patient.

Of the 38 patients observed over a five-year period, 10 were living without any complaints; 25 had died of carcinoma; and 3 had had recurrences. These findings correspond to an absolute cure in 26.3 per cent. Of the 23 patients observed during a period less than five years, 12 were living, 9 had died of carcinoma, and 2 had had recurrences. Of the 61 patients in both groups, 39 had died; 34 of these died from the carcinoma; 18 were still in the hospital; therefore exact deductions, as tabulated, are presented.

The five-year cures of vulvar carcinoma, which in his cases comprised 26.3 per cent, were compared with those reported in the literature during the period from 1930 to 1936. In the latter group, the five-year cures averaged 24.3 per cent, which is more favorable than the positive cures in portiocarcinoma.

(Hans Heidler). Mathias J. Seifert, M.D.

**Lanterwein, C.: Cysts and Glands of the Vagina** (Cysten und Druesen der Scheide). *Ztschr. f. Geburtsh. u. Gynaek.*, 1937, 115: 141.

This study is based upon 70 cases of cysts and glands of the vagina in adults. As to the pathogenesis of these structures, the author relies upon more recent knowledge of the development and errors of development of the vaginal epithelium.

The size of the cysts varied from that of a pea to that of a bean. Cysts about the size of a walnut seem to be most frequent. The differences in size appear to be dependent largely upon mechanical factors; for example, cysts deeply situated in the tissue must overcome greater resistance in their enlargement than those located superficially. The cysts also swell before the menstrual period, analogous to endometrioid rests in the vagina. Because of secretory pressure and proliferation, cysts superficially situated may develop so actively in the direction of least resistance, i. e., toward the vaginal lumen, that they become pedunculated. Deep-lying cysts with little protuberance may simulate the appearance of cystocele or rectocele.

The cysts seem to have a predilection for certain localities, particularly the lower third of the anterior wall and the upper third of the posterior wall. Muscular fasciculi situated in the cyst wall are to be regarded as pre-existent muscular elements of the vagina. Therefore, only deeply situated cysts present noteworthy elements of this character and one may not speak of "cyst musculature." The vessels of the surrounding tissues are usually much engorged, and hemorrhages occur. Superficially, that is, outwardly, toward the vagina, the cysts have a covering of pavement epithelium corresponding to their location and with varying signs of dilatation. Subepithelial round-cell infiltration is frequent.

Chiefly through the work of Meyer, the former view, according to which the formation of the vagina was attributed solely to the ducts of Mueller, must be modified as follows: the vagina is indeed formed from the ducts of Mueller, but the epithelium of the ducts is lost and is replaced by the epithelium of the urogenital sinus. Therefore, the pavement epithelium of the vagina is derived from the urogenital sinus; the mucous epithelium of the cervix, however, is derived from the epithelium of Mueller's ducts. In the replacement of the Mueller epithelium by the sinus epithelium, especial "difficulties" result in the lower third of the vagina which may lead to a persistence of the Mueller epithelium. The fornix of the vagina and the median plane of the anterior and posterior wall are also favorite situations for developmental defects arising in this connection.

Closer analysis of the cysts shows, in fact, that an important rôle in their development must be conceded to the Mueller epithelium, that is, to the persistent rests of this epithelium. This may also be expressed in figures: of 37 cases in which cysts or glands were derived from Mueller epithelium, 27 showed a lining of pure mucous epithelium; 9, a mixture of mucous and pavement epithelium.

Next in frequency to the Mueller epithelial cysts were the vaginal cysts derived from the paraurethral duct-rests or the vestibular glands. Of these there were about 13 cases.

Cysts of the Wolffian ducts were recognized in 3 cases. They are distinguished by their location in the lateral walls and by a characteristic epithelium, arranged in one row, devoid of mucus, cuboid in form, and possessing rather round nuclei rich in chromatin. By dilatation of the cysts, of course, the epithelium may be flattened considerably; this circumstance, like mechanical relationships in general, must in all cases receive special consideration in interpretation. Other cysts originate in adenofibrosis of the vagina, such as ectopic endometriosis. Of this type there were 2 cases.

In 5 cases, particularly after perineal lacerations and operations, traumatic epithelial cysts were recognized. (Froboese). J. M. Salmon, M.D.

## MISCELLANEOUS

**Muret, M., and Rapin, O. J.: The Treatment of Urinary Incontinence in Women** (Du traitement de l'incontinence d'urine chez la femme). *Gynéc. et obst.*, 1937, 36: 81.

Urinary incontinence may be intermittent, partial, or total, and is painless. There are two main classes of urinary incontinence, namely, urethral and vaginal, the latter being due to a vesicovaginal, uterovaginal, or ureterovaginal fistula. Only the first class is considered in the present article and in its discussion cases of congenital and nervous origin, whether organic or functional, are excluded, as these cases, if not incurable, should respond to special medical measures.

After reviewing the anatomy of the urethra and the mechanism of closure of the bladder, the author proceeds to consider the pathogenesis of urinary incontinence. The two principal causes are protrusion of the anterior vaginal wall at the sphincteral level, and certain local lesions including muscular tears, lacerations, or cicatrices at the level of the sphincter of the bladder or in the vicinity of the urethra. Local examination in cases of the first type will reveal a more or less pronounced prolapse of the anterior vaginal wall, which is exacerbated on sneezing or straining. A few drops or small jet of urine will escape during such exertion, but this is checked if an attempt is made to keep the anterior wall of the vagina at the level of the urethrovaginal orifice, or if during the examination the index finger is inserted to push the vaginal walls upward. The anterior wall of the vagina is intimately connected with the posterior

wall of the urethra, which is therefore pulled down with it. As the anterior wall of the urethra is fixed, it cannot descend and there results a funnel-like dilatation of the posterior segment of the urethra due to traction on the trigonal sphincter. As soon as intra-abdominal pressure is increased, the latter opens and permits urine to escape. This also occurs when there is a urethrocele near the neck of the bladder, even if the lower vagina and urethra have not descended. If a colpocele is located above the sphincteral region, there is no incontinence, for the reason that the urethral walls remain parallel and the sphincter remains intact.

Cystoscopy will reveal gaping of the sphincter and flattening of its inferior margin. Vaginal prolapse is sometimes so slight that its importance in the pathogenesis of incontinence is often unrecognized.

The authors discuss the views of Stoeckel, who is the chief advocate of the theory that organic and traumatic lesions are the cause of incontinence. They call attention to a peculiar geographical distribution of adhesions and cicatrices of the trigonal sphincter, which are more common in Berlin than in Vienna and Lausanne. It is possible that traumatic lesions have diminished in incidence as the cesarean operation is at the present time being used more frequently in preference to more complicated obstetrical procedures.

It is generally agreed that puerperalism is the chief cause of incontinence. In the first place, pregnancy gives rise to hyperplasia and hypertrophy of the tissues with resulting increased mobility of all the organs of the lesser pelvis, and in particular of the anterior vaginal wall. It is especially labor, whether spontaneous or forced, which causes a distention and considerable dislocation of the vaginal walls, as well as lesions and lacerations of the pelvic support. In the post-partum period incomplete involution of the organs, including the vaginal walls, with subsequent prolapse and retroversion, plays a part. The incontinence may become manifest immediately after labor, or even as late as the postmenopausal period. It may develop after a perfectly normal labor. However, incontinence occurs also in nulliparas and in virgins, in whom one may find a congenital or acquired laxity of the tissues, as well as an abnormally marked convexity of the anterior vaginal wall, or a veritable prolapse without any lesions whatsoever. Obesity or emaciation may give rise to incontinence with anterior vaginal prolapse just as frequently as puerperalism. Finally, incontinence may develop following gynecological operations or accidents, in which case one usually has to deal with a fistula. Incontinence is said to occur in about 15 per cent of the cases, especially in multiparas with prolapse. Danzel even goes so far as to state that less than 80 per cent of women are perfectly continent.

From a prophylactic viewpoint, it might be well to emphasize the danger of forced dilatation of the urethra, although this method is not used so frequently now as formerly for removal of large calculi. In multiparas, the vaginal walls may be supported by a pessary. Prolonged labor should be avoided and special precautions taken during management of the third stage. Vaginal or perineal tears should be repaired with deep, not superficial sutures, and clamps should not be used. Measures should be taken to hasten involution. Exercise and gymnastics with massage of the abdominal and pelvic muscles, combined with oxytocic drugs will hasten involution. Constipation and prolonged retention of urine should be avoided. In cases of retarded involution and flaccidity of the tissues, hot, astringent vaginal douches or suppositories may be beneficial. In cases associated with retroversion a well chosen Hodge's pessary may give relief; pessaries have a palliative effect also after incontinence has been established.

Various procedures have been described for the surgical treatment of urinary incontinence. The simplest and most generally used method is anterior colporrhaphy, the purpose of which is to diminish the distended surface, to relax the anterior vaginal wall, and to suppress the exaggerated convexity and the cystocele so often present. However, it diminishes the vaginal surface only in its transverse diameter and for this reason Muret, in 1913, suggested a T-suture which diminished the vaginal surface both transversely and longitudinally. Colporrhaphy supplemented with colpoperineorrhaphy, will often suffice to cure slight incontinence, but usually some type of reinforcement is required. The author briefly describes the purse-string suture at the base of the bladder, and the procedures of various other investigators, especially that of Goebel-Frangenheim-Stoeckel, which is known as pyramidoplasty. It is indicated in complicated cases with severe lesions of the urethra and extensive cicatricial adhesions between the bladder and pelvis; in these cases direct myoplasty will not suffice. Many surgeons consider this operation the method of choice for the treatment of incontinence. According to Mikulicz-Radetzki it will yield favorable results in 86 per cent of the cases. The operation is quite tedious and difficult, however, with difficult hemostasis. In an effort to simplify the intervention several modifications have been suggested by Miller and Bonafonte. Schoenholzer has recommended a Kocher exohysteropexy as a supplementary procedure to the Goebel-Stoeckel procedure. As a rule, anterior colporrhaphy suffices, and the other more complicated procedures should be reserved for cases with extensive adhesions, severe organic lesions, and recurrences.

EDITH SCHANCHE MOORE.

# OBSTETRICS

## PREGNANCY AND ITS COMPLICATIONS

**Keller, R., and Schmitt, L.: Considerations on Malformations of the Uterus, Together with Case Reports on Pregnancy and Labor** (Quelques considérations concernant les malformations utérines en rapport avec la grossesse et l'accouchement). *Rev. franç de gynéc. et d'obst.*, 1937, 32: 620.

The authors report a case of cloistered bicornuate, unicervical uterus discovered during operation for a cystic pelvic mass. The mass proved to be a hematometra of the right cornu of the uterus, which could not be completely resected because of complicating adhesions. The postoperative course was stormy, but recovery was complete. Three years later the patient returned with an advanced pregnancy, and at term was delivered of a normal infant in breech presentation.

In a review of 30,000 deliveries in the past fifteen years at the "Maternité" of the City Hospital of Strasbourg, 15 malformations of the uterus, all of which were diagnosed as uterus bicornis unicollis or some minor variation of this deformity, were discovered. Among the 15 cases there were 41 pregnancies, 21 of which went to term, 7 premature deliveries, 13 abortions, 22 living children, and 6 dead infants. These figures were found to be in accord with those of many of the authors who have reported on this subject. GEORGE C. FINOLA, M.D.

**Philipp, E.: Pyelitis and Pyelonephritis in Pregnancy** (Pyelitis und Pyelonephritis in der Schwangerschaft). *Zentralbl. f. Gynaek.*, 1937, p. 1820.

The experience with a large series of patients and several appended case histories are presented in this article. They justify new and sweeping statements concerning the much discussed pyelitis and pyelonephritis in pregnancy.

In a general manner the author presents his views concerning the cause and pathogenesis of pyelitis of pregnancy. In the majority of cases the process is a descending one; clinical and anamnestic evidence indicates that the process has its origin in the kidney pelvis which has been infected by the hematogenous route. The causes are the atonic state of the intestines, renal pelvis, and ureter. The fact that the right kidney is more frequently affected is due to the mechanical pressure of the dextrorotated uterus. The dilatation of the renal pelvis and ureter is caused by the placental hormone. This dilatation can be brought about in non-gravid as well as senile women by transfusions of blood from pregnant donors; such transfusions were made by the author, but for other reasons. A high meat and low vegetable diet, which is common in Pomerania, is a definite factor in pyelitis. This factor plays a large rôle as is shown by the high incidence of pyelitis in the Greifswald clinic (3 per cent of all obstetrical admissions).

The symptoms of pyelitis gravidarum are concerned largely with the involvement of the kidney substance by the infection, which in such instances becomes grave. It was not always easy to determine the danger zone. The following factors indicate a dangerous turn of events: high fever and numerous chills, oliguria, increasing non-protein nitrogen, the appearance of hemoglobin, and tyrosine and leucine crystals in the urine, and the combination of pyelitis and general toxicosis, which is always secondary. Hematuria is, in itself, no serious symptom. It is noted, as shown in certain instances, even in mild cases of pyelitis. In all severe cases, with steady increase of the grave symptoms and the obvious development of toxicosis, interruption of pregnancy is indicated. This, however, is the only time when therapeutic abortion is indicated. These exceptions do not invalidate Stoeckel's thesis that interruption of pregnancy is never necessary in pyelitis of pregnancy.

(G. SCHAEFER). HAROLD C. MACK, M.D.

**Traut, H. F.: Pyelo-Ureteritis in Pregnancy.** *Am. J. Obst. & Gynec.*, 1937, 34: 392.

Three factors are of paramount importance in the production of pyelo-ureteritis in pregnancy. These are stasis, trauma, and infection. It is noteworthy and probably very significant that over 95 per cent of the cases of pyelitis of pregnancy are caused by organisms belonging to the colon group of bacilli. The fact that the bacillus coli is the chief pathogenic invader suggests very strongly that this organism comes to the urinary tract from the bowel and that it does this either by direct ascent of the lumen of the tract or by being transported there by way of the lymphatic system.

Pyelo-ureteritis occurs as frequently in multiparas as in primigravidas. The onset of the initial attack is usually in the last trimester of pregnancy, or in the early puerperium. The first symptom may be hematuria, although this is by no means constant. The acute phase is usually accompanied by a marked elevation of the temperature, hectic in type, and associated with chills.

The palliative treatment consists of rest in bed, with frequent change of position which shifts the weight of the uterus from side to side so that the ureters can be emptied more readily and drainage of the tract be improved. Fluids are forced, a bland diet is prescribed, and a mild saline purge is administered every other day. Immediately upon admission, three laboratory procedures are carried out: (1) a catheterized bladder specimen is secured for examination and culture; (2) the blood is examined to discover whether or not there is nitrogen retention; and (3) an intravenous x-ray pyelogram is made to furnish information as to the degree of damage already caused by the inflammatory process

and to serve as a rough test of kidney function. If the organism is a colon bacillus, if there is no non-protein nitrogen retention, and if the process is unilateral, the patient is given the palliative treatment for as long as seven days.

If, on the other hand, the patient does not respond to this conservative treatment after six or seven days of palliative therapy, the affected ureter is catheterized with a No. 7 or No. 9 catheter, which is left in place with the tip high in the tract to provide drainage. The catheter is left in position not more than three or four days, when it is removed whether or not the temperature and other symptoms have subsided. While the catheter is in position, lavage of the kidney pelvis with normal saline solution is carried out at four-hour intervals.

When the infection is bilateral, one is not justified in giving palliative therapy for so long a period, particularly if the patient is two or three months from term. If, in addition to a well-established bilateral infection, one discovers non-protein nitrogen retention, the termination of pregnancy should be mandatory. The danger of a fatal outcome for the mother is such a great possibility that delay should not be tolerated.

Post-partum treatment is necessary until repeatedly negative urine cultures are obtained.

EDWARD L. CORNELL, M.D.

**Eastman, N. J.: Heart Disease in Pregnancy: The Respective Duties of Internist and Obstetrician.** *Med. Clin. North Am.*, 1937, 21: 1407.

Cases of heart disease in pregnancy are best handled by the obstetrician and cardiologist in close coöperation.

The first fact which the obstetrician will want to know is whether the woman has rheumatic heart disease. Apparent cardiac enlargement, systolic murmurs, accentuation of the pulmonary second sound, shortness of breath on exertion, and even crepitant râles at the base of the lungs may be present at times in pregnant women who have perfectly normal hearts.

The two alterations in the heart during pregnancy which most frequently simulate disease are the change in cardiac outline and the occurrence of murmurs. The former is due in part to mechanical factors, namely, the growing uterus and elevated diaphragm, and in part to an actual increase in the total area of the cardiac outline. Thus the positional relationships of the heart in the thoracic cavity are frequently changed. Murmurs occur in from 10 to 20 per cent of gravid women as the other common alteration in pregnancy which may suggest heart disease. They are to be most logically associated with upward pressure of the enlarging uterus upon the diaphragm and in turn upon the heart. It is quite important to examine heart murmurs during pregnancy with the patient in the standing, as well as in the recumbent position. As a general rule, diastolic murmurs are not physiological, but are evidence of rheumatic heart disease.

The second help which the obstetrician will expect from the cardiologist is in prognosis. Pregnancy is associated with a substantial increase in cardiac output, on the average, 50 per cent more work than in the pre-gravid state. There is a greater amount of tissue to be supplied with blood, and more blood must be pumped in the circulatory system, adjustments which would naturally demand an increase in the output of the heart per minute. It is necessary that the functional capacity of the heart be evaluated from as many points of view as possible, with consideration of the behavior of the heart in previous pregnancies and labors.

The manner in which the obstetrician carries out this task will, of course, vary greatly, according to the needs of the particular case. Keeping in mind the classification of the New York Heart Association, patients grouped in Class 1 and Class 2a may, with rare exceptions, be allowed to go through pregnancy and the first stage of labor; if the second stage promises to be short, spontaneous delivery may be permitted, but if it threatens to be long, delivery by forceps is usually desirable. Adequate rest during the whole prenatal period, avoidance of upper respiratory infections, recognition of early signs of heart failure, and care during labor are the chief considerations for the successful handling of these patients.

For Class 2b patients, delivery by the natural passages may be permissible, if there has been no history of heart failure and if they are multiparas. In the majority of this group, cesarean section will be the procedure of choice. If decompensation has occurred during the present pregnancy, the operation should be done under local infiltration anesthesia. If no recent heart failure has occurred the non-inhalation anesthetics are still to be preferred, but "open ether" is permissible. The operation should be performed with the head and shoulders slightly elevated. Under no circumstances should a patient with heart disease be submitted to the Trendelenburg position. At the close of the operation the patient should be sterilized.

The treatment of patients in Class 3 resolves itself essentially into the treatment of heart failure in pregnancy, labor, and the puerperium. A cardinal fact is that in the presence of heart failure delivery by any known method carries with it a maternal mortality of over 50 per cent. Decompensation having been allayed, cesarean section under local infiltration anesthesia is the method of choice for delivery.

CHARLES BARON, M.D.

**Danforth, W. C.: Carcinoma of the Cervix During Pregnancy.** *Am. J. Obst. & Gynec.*, 1937, 34: 365.

The frequency of carcinoma in pregnancy, as estimated from several reports and including the author's own work, is 0.0321. The pregnancy is unfavorably influenced. Abortions are frequent and placenta previa is more common than in normal pregnancy. Labor may be very dangerous and is sometimes impossible.

The result of treatment is far better during the first six months than in the last three. Today

irradiation, both with radium and deep x-rays, is the most effective treatment. This should be done at once unless the pregnancy is so far advanced that it is desired to allow the child to attain viability. If full radiotherapy is used, it is better to terminate the pregnancy because of the risk of serious developmental harm to the infant. A moderate radium dosage may be used to check the growth of the tumor in order that the child may attain viability with less likelihood of harm. Incision or dilatation of the carcinomatous cervix is very dangerous. If labor is not possible, cesarean section should be done as an elective measure. This should be followed by a Ries-Wertheim radical hysterectomy or subtotal hysterectomy with irradiation of the carcinomatous stump. The latter is favored.

EDWARD L. CORNELL, M.D.

**Cosgrove, S. A.: Surgical Complications of Pregnancy.** *Am. J. Obst. & Gynec.*, 1937, 34: 469.

The diseases which may occur concomitantly with pregnancy should, in general, be thought of and managed just as though the pregnancy did not exist, and the pregnancy itself should not be interfered with because of the simultaneous occurrence of such diseases.

The author reports 23 acute conditions occurring in 25,000 pregnancies in which abdominal surgery was necessary. There were 19 cases of acute appendicitis in which all the women were delivered *per vaginum*. One woman died, but she was admitted after two days of purgation. Two cases of twisted ovarian cysts, 1 case of degenerated uterine fibroid, and 1 case of adenocarcinoma of the ovary were operated upon. All were delivered *per vaginum*. One patient with acute hemorrhagic pancreatitis died following operation. She also was delivered *per vaginum*.

Acute appendicitis is a surgical condition invariably calling for prompt operative intervention. This indication is not modified, but is even more important when appendicitis complicates pregnancy, even at or near its termination.

Its surgical treatment should not be combined with any manipulation to terminate pregnancy. The only exceptions to this statement are the legitimacy of simple procedure to expedite termination of the second stage of spontaneous labor, and recognition of the very rare possibility of concurrent serious factors of obstetrical dystocia. When the latter are present, delivery by the abdominal route may be necessary. However, such interference should be reserved until after the onset of spontaneous labor, and an extraperitoneal approach should be selected.

The same principle applies in other surgical complications of pregnancy. EDWARD L. CORNELL, M.D.

**Molnár, M.: Surgical Complications following Covered Perforations of the Uterus** (Ueber chirurgische Komplikationen nach gedeckten Uterusperforationen). *Zentralbl. f. Chir.*, 1937, p. 1270.

For the treatment of fresh perforations of the pregnant uterus two methods are available: in aseptic cases in which other injuries can be excluded conservative therapy is indicated, otherwise immediate laparotomy should follow. It is much more difficult to decide upon operative interference if considerable time has elapsed since the perforation. To prove how easy it is to make diagnostic errors in such cases the author reports 2 cases.

In the first case, that of a thirty-three-year-old woman who had attempted an abortion on herself, a curettage was done the next day, and the perforation made at this time was not recognized by the attending physician. For five days the site of perforation was covered with a loop of small bowel and then a stormy peritonitis developed from the late secondary giving-way of this adhesion. Five days elapsed from the time of perforation and, on account of the statements of the attending physician, the life-saving operation was delayed.

The second case was that of a woman forty-four-years-old, a para-11, who after an amenorrhea of six weeks' duration took quinine powder to induce abortion, and during the cleaning out of the uterus the latter was perforated with a forceps and a loop of small bowel was injured. For three days the site of perforation was covered with the injured loop of bowel so that no peritonitis occurred. Gradually, however, an ileus developed and the patient was brought to the hospital. In the sounding of the uterus the loop of small bowel was loosened and at the laparotomy which followed immediately the injury of the small bowel was repaired and a supravaginal amputation of the uterus was done.

In both cases the injury of the uterus was covered over by an adhesion of a loop of small intestine. In late cases like the first one the time elapsed should not mislead one to delay the operation. Careful analysis of the history should lead to the correct diagnosis and treatment in such cases. In all cases of ileus following abortion the relationship between the curettage and the ileus should be considered and treated accordingly.

In conclusion, the author, who is a surgeon, emphasizes the well known rule that the instrumental evacuation of the gravid uterus is a serious procedure and ought to be done only by specialists. Unfortunately, this rule is not always followed.

(ROSSENBECK). LEO A. JUHNKE, M.D.

## LABOR AND ITS COMPLICATIONS

**Lövset, J.: Atypical Forceps and Presentation of a New Forceps Model** (A propos du forceps atypique et présentation d'un nouveau modèle de forceps). *Acta obst. et gynec. Scand.*, 1937, 17: 373.

The author describes in a brief résumé the more important modifications of obstetrical forceps since the time of Chamberlen. He emphasizes particularly the alterations designed to permit high applications upon the unrotated head and correct traction at the various levels of the birth canal.

For situations requiring delivery of the unrotated or partially rotated head the author has constructed

Fig. 1.

Fig. 2.

a new model resembling somewhat that devised by Sandborg and Vedeler. It differs from the latter in the construction of hinges upon the anterior blade, lock, and handle. The purpose of the hinge is to permit direct application of the anterior blade without the necessity of turning or wandering (Figure 1).

The hinge is fixed by a triple steel spring, 0.31 mm. in thickness. The spring is loosened or tightened by two interlocking levers. When the anterior blade has been applied to the fetal head, the lever above the handle and outside of the vulva is pressed downward, thereby fixing the hinge and conforming the blade to the fetal skull (Figure 2). A small rivet on the neck of the anterior blade forms the lock. The rivet head fits into a small slit on the neck of the posterior blade when the blades are in proper position (Figure 3). The construction and shape of the handles is shown in the illustrations.

To date this instrument has been used 97 times, both in Norway and in Berlin at Stoeckel's Clinic. Application of the blades has caused no difficulties, nor have any important maternal or fetal injuries been noted. The posterior blade is introduced first. This is never difficult to accomplish because of its extreme semicircular curvature. The introduction and fixation of the anterior blade follows.

The author lists the following advantages for his new model:

1. Exact biparietal application is always possible in either oblique or transverse presentation of the head.

2. The forceps cannot slip outside of the os during its introduction. The elastic spring keeps the blade close to the fetal head. The semicircular shape of the posterior blade aids it in conforming to the contour of the fetal skull.

Fig. 3.

3. Intracranial injuries are lessened because proper application is maintained throughout the extraction.

4. The curve of the forceps maintains proper direction of traction in all parts of the birth canal, and minimizes the force required to effect delivery.

5. The construction of the lock, which permits proper approximation of the blades and a secure biparietal grip, prevents slipping of the blades.

The author adds a final warning that exact diagnosis of position, as determined by palpation of the sutures and fontanelles, is a necessary prerequisite to the use of this as well as all other varieties of forceps, particularly in atypical applications.

HAROLD C. MACK, M.D.

**Penfold, W. J., and Butler, H. M.: Placental Infection in Induced Labor, with Special Reference to Fetal and Neonatal Mortality.** *Med. J. Australia*, 1937, 2: 128.

The data for this paper were obtained from the bacteriological examinations of 114 placentas and 12 infants; 46 placentas were derived from patients in whom labor had been induced with a rectal tube, but in the remainder labor had not been induced. Cultures were made from the blood in large vessels on the fetal side of the placenta and from tissue on the maternal side. If the child was stillborn, or if it had died within ten days, cultures were made from its heart's blood, spleen, lung, and occasionally from the liver.

Placental infection was detected two and one-half times more often following surgical induction of labor. Twenty-eight of the 46 placentas from patients in whom labor had been induced were infected. Among the 68 controls only 16 yielded a growth, and in no instance were the organisms of a characteristic fetal type. Furthermore, in the control group, infection of the placental vessels was never detected, but 14 of the induced cases yielded positive cultures. It

was also striking that there was an absence of mixed infection of the placentas among the controls and that aerobic infections were extremely rare.

The important factor in the development of placental infection after induction of labor is the length of time elapsing between the insertion of the rectal tube and the delivery of the child. The average postinduction interval for the 28 infected cases was sixty-three hours, whereas for the 18 cases in which the placenta was sterile the postinduction interval was thirty-one hours. Neither the condition of the mother nor the stage of the pregnancy appeared to be a factor in the development of an infection.

Infections of the placenta following tubal induction of labor were associated with increased risk to the life of the child. Mixed infections were more serious than infections with a single organism, and the presence of organisms in the blood of the larger fetal vessels of the placenta was associated with a strikingly high infant death rate. In 5 infants who died shortly after birth, the same types of organisms were cultured from the fetal tissues and from the placentas. This suggests that the bacteria detected in the fetus were derived from the placenta, or from the same source as that from which the placenta was infected. Furthermore, the presence of bacteria (especially bacillus coli and aerobic streptococci) in the blood of the large fetal vessels of the placenta usually indicated a similar infection of the fetus; in some cases at least this infection was probably responsible for fetal death.

In 3 cases a sample of liquor amnii was obtained at the time the rectal tube was inserted; in each instance the fluid was sterile. In 2 cases the liquor was obtained some time after the induction; in both of them it was infected.

The tendency among obstetricians to discount placental infections and to look on them as contaminations is not supported by the author's findings. Twenty-two of the 46 cases of inducted labor ran a febrile course during the puerperium. In 19 of these 22 there was infection of the placenta. Consequently, the authors believe that there is a definite relationship between fever in the mother and infection of the placenta, but there is a much less significant correlation between a febrile reaction in the mother and infection in the fetal placental vessels.

GEORGE H. GARDNER, M.D.

## MISCELLANEOUS

**Weymeersch, A., and Snoeck, J.: The Treatment of Uteroplacental Apoplexy** (Traitement de l'apoplexie utéro-placentaire). *Gynéc. et obst.*, 1937, 36: 156.

In attempting to evaluate the various forms of treatment recommended for uteroplacental apoplexy, such as conservative cesarean section, cesarean section followed by hysterectomy, and hysterectomy *en bloc*, the authors take the clinical diagnosis rather than the anatomical diagnosis as a basis. Between simple retroplacental hemorrhage with its relatively discreet clinical picture and the major form of acute uteroplacental apoplexy, there exists a series of intermediary stages, the clinical aspects of which are very similar, and in which there is not always a direct relation between the severity of the symptoms presented and the appearance or extent of the characteristic lesions of uteroplacental apoplexy. To avoid erroneous conclusions the authors have excluded from their material all cases of spontaneous delivery in which the diagnosis of premature separation could be made only retrospectively even though the patient exhibited slight signs of pregnancy toxemia. The material included answers to a questionnaire sent out by the authors and cases reported in the literature.

The treatment of retroplacental hemorrhage has followed the general evolution of obstetrical therapeutic methods in the past fifty years. Two periods may be distinguished. Before the work of Couvelaire in 1911 cesarean section was rarely done for premature separation of the placenta with hemorrhage. From that time on, however, the abdominal method began to take its place side by side with the old obstetrical methods, which gave very poor results in many cases.

The authors are convinced that in a large number of partially toxic placental detachments, the characteristic organic lesions of uteroplacental apoplexy may be present so that it is difficult to estimate the frequency of this type of retroplacental hemorrhage.

The cause of toxic retroplacental hemorrhage is not known. Prophylactic measures are still symptomatic, if not empirical. However, as the condition is most frequently associated with or preceded by albuminuria, hypertension, and edema, it seems logical to combat these symptoms as early as possible. In general, the prophylaxis of retroplacental hemorrhage corresponds to that of eclampsia. Albuminuria is not so constant a finding in the hours or days preceding retroplacental hemorrhage as preceding eclampsia. The demonstration of a relative hypertension may have greater significance in prophylaxis than a single manifestation of a more severe degree at the end of pregnancy. Water retention or the so-called "hidden edemas" may be detected by regular weighing. There is usually an abnormal increase in weight preceding attacks of hypertension or albuminuria. Premature separation of the placenta occurs almost twice as often in patients with pregnancy toxemia as in patients with simple edema. Portes reports the coexistence of pregnancy toxemia and uteroplacental apoplexy in 91.3 per cent of the cases.

After giving a brief résumé of the opinions of several authorities in regard to the most suitable treatment for uteroplacental apoplexy, the writers compare the mortality statistics of the various methods of treatment. Maternal mortality from the obstetrical methods averaged 6.58 per cent, and from the surgical methods, 21 per cent. Fetal mortality from the obstetrical methods averaged 61.63 per cent, and from the surgical methods 70.70 per cent.

In their study of the obstetrical methods of treatment of uteroplacental apoplexy, the authors divide their material into cases with spontaneous delivery in spite of various procedures, such as artificial rupture of the membranes, incision of the cervix, manual or instrumental dilatation, and cases with rapid artificial delivery of the fetus through an insufficiently dilated cervix.

The highest mortality rate, 22.5 per cent, was observed in cases treated by vaginal cesarean section followed by version. Cases treated by forceps and by breech extraction had mortality rates of 14.3 and 14.7 per cent, respectively. The general maternal mortality rate following obstetrical procedures with spontaneous deliveries was 12.5 per cent, and following forced delivery, 55 per cent; after surgical procedures the mortality rate ranged from 41.1 to 54.8 per cent and depended upon the operation used. Treatment by the expectant method as described by Solomons had a maternal mortality rate of only 3.78 per cent. Stroink, who also favors expectant treatment, reported a maternal mortality rate of 11.5 per cent from surgical procedures and only 5 per cent from expectant treatment, with a fetal mortality of 65 per cent for the former and 78 per cent for the latter method. Both de Snoo and Stroink were formerly advocates of prompt surgical intervention in cases of uteroplacental apoplexy.

The incidence of secondary hemorrhage due to uterine atony is in direct proportion to the incidence of obstetrical intervention.

The surgical procedures used for the treatment of uteroplacental hemorrhage include conservative cesarean section, cesarean section followed by hysterectomy, and abdominal hysterectomy *en bloc*. The extent of the lesions cannot be taken as a guide in the selection of the operative procedure. The mortality rate in cases in which the uterus was emptied within ten hours of onset was 27 per cent as compared to 40 per cent in cases in which it was emptied after ten hours. However, in the latter the mortality rate from obstetrical methods was only 30 per cent as compared to 50 per cent from surgical methods, which would seem to contradict the theory that secondary hysterectomy or hysterectomy *en bloc* will ameliorate maternal prognosis by suppressing the focus of intoxication. Many writers perform hysterectomy only in cases in which the intravenous injection of posterior pituitary extract fails to produce a uterine reaction. The present writers used orasthin, the oxytocic fraction of the posterior pituitary body, for this test. Also the routine administration of ergometrine as suggested by Dale constitutes an advance from this point of view.

Future pregnancy does not seem to be prevented by uteroplacental apoplexy, and is limited only by chronic renal insufficiency or vascular sclerosis existing before the apoplectic incident. In 8 cases of recurrent uteroplacental apoplexy, Stroink noted symptoms of chronic nephritis or vascular sclerosis. Siedentopf recommended sterilization in cases of recurrent placental separation. More than two-thirds of the patients dying from uteroplacental apoplexy die of anemia.

It was found that the operation presenting the lowest mortality rate was low cesarean section without exteriorization of the uterus. Operation during the height of hemorrhagic symptoms, at the time of peritoneal shock, should be avoided. Before operation is performed, the patient should be thoroughly warm; injections of physiological serum and cardiotonics should be given and blood transfusions performed if necessary. The routine use of posterior pituitary extract administered intravenously or ergometrine should reduce the indications for hemostatic hysterectomy. Hysterectomy *en bloc* has been abandoned, as it failed to yield the expected results. The only two methods of anesthesia permissible are ether and local anesthesia. Fetal mortality must always be a secondary consideration. The authors, who were formerly convinced of the value of prompt surgical intervention, are beginning to believe that the expectant treatment is to be preferred.

EDITH SCHANCHE MOORE.

# GENITO-URINARY SURGERY

## ADRENAL, KIDNEY, AND URETER

**Rosenberg, W.: Adenoma of the Adrenal Gland Associated with Grawitz Tumor of the Kidney.** *J. Urol.*, 1937, 38: 251.

The author reports 2 cases of large adenoma of the adrenal gland associated with Grawitz tumor of the kidney. Adenoma of the adrenal gland is found comparatively rarely, either clinically or at autopsy. It may be differentiated from nodular hyperplasia of the adrenal gland by its atypical and neoplastic structure. Usually, adenoma of the adrenal gland is single, though it may be multiple or bilateral. It forms projecting masses, yellow or red in color, well circumscribed from the cortex of the gland, but often deforming or destroying the organ. Hemorrhage and central softening may occur. The tumor may reach a considerable size and may weigh from 2 to 4 oz. while retaining the adenomatous structure. A fibrous stroma is nearly constant and may be abundant, and thereby render the tumors quite firm and fibrous. More often the stroma is fine and vascular. The tumors are rarely surrounded by a definite capsule. The structure may reproduce exactly that of the adrenal cortex, with an increase in the size of the cells, hyperchromatism of the nuclei, and often marked fatty changes; the cells may, however, be smaller, more numerous, granular, and free from fat.

The limits of growth of adrenal adenoma are restricted. In pure form they do not reach large dimensions or produce metastases, and most of them are encountered at autopsy. Malignant transformation into adenocarcinoma, or a still more atypical growth, is relatively common.

From a review of the literature, it is believed that the occurrence of an adenoma of the adrenal gland associated with an extensive Grawitz tumor of the kidney is probably rare. In the cases herein reported, there was no evidence of pseudohermaphroditism.

A white male, aged sixty-six, complained of pain in the lower right quadrant. The pain had been dull and constant for a period of six months. During the past fifteen years he had had many attacks of acute pain in the same region. He also complained of malaise and shortness of breath. Recently, he had noticed a mass in the lower right quadrant. The patient was poorly nourished and showed marked evidence of emaciation. Upon cystoscopic examination the bladder urine was clear, grossly. The bladder mucosa showed generalized trabeculation. There was a small, shallow diverticulum just above the trigone and median to the right ureteral orifice. The prostate showed moderate intraurethral hypertrophy with no evidence of malignancy. The ureteral orifices appeared normal. On the left side, a No. 6 catheter was passed with no obstruction. On the right side there was some resistance to the catheter, but after manipulation the catheter was passed in its entirety. Clear urine was obtained from both sides.

The plain film showed irregular calcification in the region of the right kidney. The left pyelogram was normal. The right pyelogram showed downward displacement of the renal pelvis and calyces. There was a sponge-like area of calcification lateral to the tip of the superior major calyx. The middle and inferior calyces pointed downward and the superior calyx pointed mesially. The upper portion of the ureter overlapped the spine.

Nephrectomy was performed in the usual manner. After severance of the pedicle, tumor tissue could be seen extending into the renal vein as far as it could be palpated. The patient was in severe shock following the operation, and died nine days later from uremia. The pathological diagnosis was adenoma of the adrenal gland; Grawitz tumor of the kidney with degenerative changes and areas of hemorrhage, scarring and calcification; invasion of the blood vessels and wall of the ureter; chronic and subacute pyelitis.

The second case was that of a white woman, aged sixty-two. In the course of routine examination, a mass was discovered in the upper left quadrant. There were no urinary disturbances, although the urine contained a moderate number of red blood cells and pus.

Cystoscopy showed the bladder urine to be clear, grossly, and no abnormalities were noted in the bladder. Catheters were easily passed to the pelvis of both kidneys and clear urine was obtained from both sides.

The plain film showed the outline of the left kidney to be tremendously enlarged, with an irregular calcification in its upper portion. The right pyelogram showed moderate hydronephrosis. The left pyelogram showed marked displacement of the pelvis downward and toward the spine. The calyces could not be seen.

The patient consented to operation because of the continued hematuria and anemia. An irregular and freely movable tumor mass was present in the left abdomen. This mass extended to the midline, and from the costal border above to well below the iliac crest. Several transfusions were given prior to nephrectomy. Recovery was uneventful, but within one month metastases were noted in both lower extremities and the skull, likewise, showed extensive involvement. Death occurred six months later. The pathological diagnosis was adenoma of the adrenal gland with marked degenerative changes, Grawitz tumor of the kidney with extension through the capsule, degenerative changes, hemorrhage, defect formation, and calcification.

C. Travers Stepita, M.D.

**Åkerlund, Å.: The Technique of Roentgen Examination of the Exposed Kidney** (Ueber die Technik bei Roentgenuntersuchung der freigelegten Niere). *Acta chirurg. Scand.*, 1937, 79: 553.

The author recommends special flexible film packs, resembling dental films, for roentgen examination of the exposed kidney. Each pack contains two films, size 7 by 13 cm., with rounded corners, and a thin tinfoil covering on the back. In order to preserve sterility, a relatively long, sterilizable charging case of non-rust steel is used and over this a sterile rubber glove is drawn up to its palmar surface. The film pack is introduced through the charging case. The entire package is then tied crosswise by a linen band, and obliquely on the reverse side with the fingers and wrist part of the glove folded in (Figure 1).

During the exposure the film pack must be applied to the kidney by bending and fastened with two rubber bands placed crosswise (Figure 2). It may also be applied with gauze packing. In many cases an anteroposterior exposure suffices, but profile exposures show whether a stone lies in the anterior or posterior half. In the upper left-hand corner of each film pack a paper clip is fastened to distinguish the two poles and the anterior and posterior halves of the kidney.

LOUIS NEUWELT, M.D.

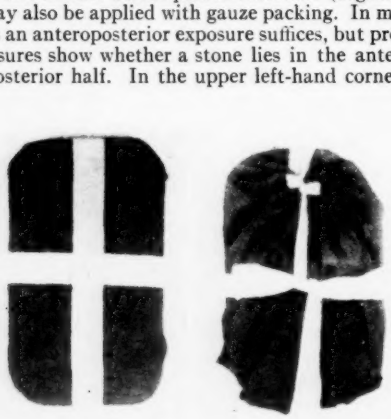

Fig. 1. The film pack introduced in the rubber glove, ready for use, front and back views.

Fig. 2. The film pack fixed by means of two rubber bands placed crosswise.

**Mathé, C. P.: Renal Tuberculosis in Children** (La tuberculose rénale de l'enfant). *Arch. d. mal. d. reins et d. organes génito-urinaires*, 1936, 10: 517.

Mathé reports that in 4,698 cases of unilateral renal tuberculosis collected from the literature, there were 565 cases in children and adolescents from one to twenty years of age, i.e., 12 per cent. These included 20 cases, 0.42 per cent, in children from one to five years of age; 51 cases, 1.08 per cent, in children from five to ten years of age; and 494 cases, 10.5 per cent, in older children and adolescents from ten to twenty years of age.

Six cases in patients from eight to eighteen years of age operated upon by the author are reported. The author notes that in younger children, below the age of five years, there is a tendency to rapid generalization of the tuberculosis, and unilateral renal tuberculosis is of rare occurrence. Above the age of five years, unilateral renal lesions are found more frequently and are more easily diagnosed. Bilateral renal tuberculosis is not a surgical condition; the parenchyma of the kidneys is usually extensively involved, and the symptoms are those of nephritis; the urine is clear but contains tubercle bacilli.

Unilateral renal tuberculosis is of three types: (1) pyonephrosis with the ureter closed, (2) pyonephrosis with perinephritis or perinephritic abscess, and (3) the form with caseous lesions and cavity formation and a permeable ureter. If the diseased kidney is not removed the opposite kidney may become infected. If stricture of the ureter results in its complete occlusion, the tubercle bacilli may disappear from the urine and symptoms may subside, but this does not indicate healing of the tuberculosis; the kidney may become completely calcified, but this rarely occurs.

In children with a chronic cystitis, pyuria, and pyelitis that are resistant to treatment, renal tuberculosis should be suspected. If the urine in such cases is acid and turbid or opalescent, but does not contain the organisms usually found in pyelonephritis, a special search should be made for the tubercle bacillus. The cystitis is accompanied by frequent micturition, recurrent hematuria, and nocturia. There may be pain in the lumbar region and renal colic due to stricture of the ureter, and the kidney may be palpably enlarged. General symptoms of tuberculosis may develop, such as fever, night sweats and loss of weight. These children may show evidence of tuberculosis elsewhere, in the lungs, glands, bones, or joints; such lesions may be active, quiescent, or healed. In order to demonstrate the presence of tubercle bacilli in the urine, repeated examinations must be made; if the organisms found are not definitely identified by staining methods, guinea-pig inoculation may be necessary. A complete urological examination

should be made in children who show a pyuria that persists for more than four weeks in spite of treatment. With modern cystoscopes of small caliber, such a urological examination can be made even in young children. The appearance of the bladder in children with renal tuberculosis is similar to that in adults. The function of the affected kidney is usually definitely reduced as shown by renal function tests. Pyelography often shows deformity of the pelvis with the characteristic worm-eaten appearance; the calices sometimes are irregularly dilated. In cases in which cystoscopy is difficult or impossible, intravenous urography is often of aid in establishing the diagnosis.

The treatment of unilateral renal tuberculosis in children is the same as in adults, i.e., nephrectomy in an early stage. While most surgeons report cures in over 50 per cent of the adults following nephrectomy for unilateral renal tuberculosis, Falci reports cures in only 24 per cent of the children. While the author cannot report a large series of cases of unilateral renal tuberculosis in children, of his 6 patients upon whom nephrectomy was done, 4 are in excellent health, 2 without any symptoms for ten years, 1 for four years, and 1 for three years after operation. These results indicate that the cures in children after nephrectomy average considerably more than 24 per cent. In 2 of the author's cases nephrectomy was apparently done after the disease had become generalized. In children there is undoubtedly a greater tendency to early generalization of tuberculosis after nephrectomy than in adults. In addition to nephrectomy at an early stage, the treatment should include heliotherapy after operation and the general hygienic regimes of the modern tuberculosis sanatorium; radiotherapy is also of value, but it should not replace operation when the disease is unilateral. ALICE M. MEYERS.

**Lepoutre, C., and Dewailly, A.: Extra-Vesical Terminations of the Ureter in Women** (Les abouchements extra-vésicaux de l'uretère chez la femme). *Arch. d. mal. d. reins et d. organes génito-urinaires*, 1936, 10: 551.

Lepoutre and Dewailly note that formerly ureteral anomalies were only anatomical curiosities discovered at autopsy, but in recent years the development of pyelography has made it possible to diagnose and study such anomalies in living persons. The diagnosis of ectopic ureter is made more frequently in females than in males; Kilbane collected 98 cases from literature, adding 2 of his own. Of these 100 cases, 65 were in women and of the 65, 58 were diagnosed during life; 35 were in men and all but 2 of these were found only at autopsy.

In perhaps a third of the cases of ectopic ureter, there is a single kidney, but in the other two-thirds the kidney is double with two ureters, one terminating normally in the bladder, the other outside of the bladder. According to Weigert the ectopic ureter corresponds to the upper kidney. If the ectopic ureter originates in a single kidney, this kidney is always dilated and the parenchyma is atrophic. In the double kidney, the lower portion shows a normal parenchyma; the upper portion is small, consisting of a dilated renal pelvis surrounded by a thin layer of parenchyma. This atrophic kidney has practically no function. The orifice of the ectopic ureter is narrower than normal; the ureter is dilated and tortuous.

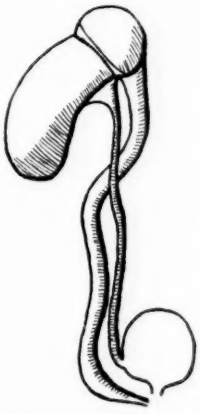

Fig. 1. The case reported is a good example of the most frequent type: The ectopic ureter corresponds to the upper kidney or double kidney. Note the atrophy of the upper kidney and the dilatation of the ureter.

The chief symptom of an abnormal termination of the ureter is incontinence of urine, which has been present since birth; usually it is continuous, day and night, and is not affected by the position of the patient. In some instances the urinary incontinence ceases to be continuous and becomes intermittent. This may be due to loss of function of the atrophic kidney or to the dilatation of the ectopic ureter which serves as a "reservoir" for the urine. When the character of the urinary incontinence suggests an abnormal termination of the ureter outside of the bladder, careful examination of the vulva, the urethral meatus, and the vagina must be made to locate this orifice. This orifice is usually found in the urethra or in the vulva near the urethral meatus. Less frequently it is found in the vagina, and occasionally in the uterine cervix, or in the rectum. If the orifice is found, it should be catheterized, and if urine is obtained, an opaque medium should be introduced for radiographic examination. This usually shows the ureter to be more or less dilated and tortuous, terminating in a small dilatation. If the orifice is too small to admit a catheter, it may be dilated. If the abnormal ureteral orifice cannot be found, bilateral pyelography is indicated; the absence of the upper calyx on one side only indicates the probability of an ectopic ureter.

The treatment of choice is partial nephrectomy, removal of the ectopic ureter and the upper atrophic

kidney in which it originates, in cases with a double kidney. It is not necessary to remove the ectopic ureter completely, but the greater portion of it should be removed. The entire pelvis and parenchyma of the atrophic kidney should be removed, even though this procedure involves removal of some of the normal parenchyma; a wedge-shaped incision into this normal parenchyma is made. This incision is closed with catgut; or, if hemostasis seems difficult, a fragment of muscle taken from the patient may be introduced into the incision.

The authors report an illustrative case in a girl eleven years of age, who had had continuous urinary incontinence all her life, but the amount of urine so passed was relatively small. She also urinated normally at regular intervals. Examination showed a urethral orifice on the left side, just below the urethral meatus, which admitted a probe. Radiographic examination with an opaque medium introduced into this orifice showed the dilated ureter extending into the upper portion of the left lumbar fossa. At operation a double kidney was found; the upper kidney, in which the ectopic ureter originated, was atrophic with a dilated pelvis. The lower kidney was normal. Removal of the atrophic kidney resulted in complete relief of the incontinence.

ALICE M. MEYERS.

## BLADDER, URETHRA, AND PENIS

**Thomson-Walker, Sir J.: The Treatment of the Bladder in Spinal Injuries in War.** *Brit. J. Urol.*, 1937, 9: 217.

It has long been established that destruction of the supralumbar spinal cord at any point is followed immediately by complete retention of urine, and that at a variable time following the injury the lumbar center recovers its tone, and involuntary reflex micturition becomes established. In the large number of cases that came under the author's care during the war, the following stages were clearly defined: the stage of retention and the stage of periodic reflex micturition.

The duration of the stage of retention varies in different cases, the shortest being twenty-four hours and the longest eighteen months. The average duration in 30 consecutive cases, however, was fifty-five days.

At the King George Military Hospital from May, 1915, to the end of 1916, 339 cases of spinal injury in which the bladder function was involved were examined, and as the author remained on the Staff of the hospital until late in 1919, the total number of cases was much greater.

The patients arrived at the hospital about fourteen to twenty-one days after injury. The stay in the hospital was about a month. Patients surviving that time were sent to other institutions.

During the period already noted, 111 cases were added, over 90 per cent of which arrived with serious infections of the urinary tract. Of 339 patients, 160 died from urinary infection. At the Star and Garter home 19 of 111 patients in a later stage died of urinary infection. The estimated total death rate was 80 per cent.

How was this record brought about? The universal treatment of the bladder in such cases was by intermittent passage of the catheter, and it was septic catheterization that led to the mortality already quoted. It is true that this catheter treatment was not used in some areas in France, but it was almost certain that at some part of the journey from the front to the base hospital in this country the case that had started well in such areas was infected by catheter by some well meaning blunderer.

The author, having discussed the failure of treatment of the bladder in spinal injuries during the war, passes on to examine the various methods of treatment open for choice in the future. Some of these methods were tried in the late war, but the organization was imperfect and they were not carried out consistently, but were changed according to the whim of the medical officer immediately in charge.

The surgical problem was neither difficult nor complicated. During the phase of complete retention, or retention with overflow, the problem was whether the distended bladder should be emptied, and, if so, how; the problem of the stage of periodic reflex micturition was the method of collection of the urine and the treatment of sepsis if present.

The author discusses the following methods of treatment:

1. Non-interference. It has been a tenet of the surgical creed since any of us can remember that a bladder distended with urine from obstruction or paralysis must be emptied by the surgeon at the earliest time possible.

The author has had no experience in non-intervention in cases of paralyzed bladder from spinal injury, and without more definite evidence that it has no deleterious effect on the bladder function and damage to the kidneys, he does not consider it one to recommend for universal adoption. At the same time he does think that we have made rather too much of a bogey of the distended bladder. This information should be made use of in considering the time for intervention in other methods of treatment.

2. Expression of the bladder contents by pressure and massage. As soon as possible after the injury the distended bladder is gently but firmly compressed and massaged through the abdominal wall with the object of expressing its contents, and this is repeated every four to six hours.

It is difficult to obtain statistics of this method. If the statements of some writers can be accepted, it was the sole method used in their hands; it was simple, easy, and successful, and was universally adopted at the end of the war. A few cases of this type came under the author's care in the later stages, but all had been spoiled by the passage of the catheter and had become cases of urinary sepsis caused by catheterization or by late cystotomy. The method is entirely unsuitable for cases in which ser-

ious urinary sepsis has become established. Apart from the fact that the danger of rupture of the wall is greater in an inflamed bladder, massage of a distended infected bladder undoubtedly leads to regurgitation of septic urine along the lumen of the ureter to the renal pelvis. This is certain to occur in cases of nerve paralysis and overdistention of the bladder under the hand of the masseur.

3. Intermittent catheterization. It is not necessary to discuss this method further.

4. The indwelling or tied-in catheter. A conde silk-woven catheter is passed at the earliest time possible after the injury, fastened into position, and led into a bottle. Washing of the bladder with suitable antiseptics is carried out daily. The catheter is changed twice a week. When the stage of periodic reflex micturition develops, the catheter is removed.

This method, if used as a continuous drain, has a great advantage over intermittent catheterization in that it prevents the recurring distention of the bladder and forcing of the ureter. If used with a stopper or a clip to evacuate the contents of the bladder at convenient times, it is merely a variant of intermittent catheterization with all its dangers. In continuous catheter drainage cystitis will probably develop. Urethritis is a common complication.

5. Early or prophylactic cystotomy. Early in 1917, the author published the heavy mortality statistics given in this article and recommended the entire avoidance of the catheter and the drainage of the bladder by suprapubic cystotomy before any catheter had been passed. He did not expect to avoid cystitis entirely but hoped that the cystitis could be cured without a fatal pyelonephritis. The prophylaxis was aimed at pyelonephritis, not at cystitis.

The objections to early cystotomy follow:

1. It is difficult to get a watertight drainage.

2. Cystitis is certain to develop and washing is required.

3. "Drainage of the bladder for any long period practically means the abandonment of any attempt to establish automatic function, and the bladder may be permanently damaged by the adoption of this course."

If these criticisms are reliable, it looks as if early cystotomy were condemned out of hand. But do they really carry much weight? Is it impossible for a surgeon of even moderate ability to produce a watertight suprapubic drainage? The author thinks not. There is, however, a method of cystotomy introduced by Mothersill and Clifford Morson which is even simpler, and, if slightly modified, it would be suitable for these cases. A large rubber self-retaining catheter stretched on a stilet is held ready. The skin immediately about the pubic symphysis is punctured with a scalpel and a large-sized trocar and cannula are plunged directly backwards into the bladder. The trocar is withdrawn, and the left forefinger prevents the escape of urine. The stretched self-retaining catheter is passed along the lumen of the cannula and the cannula is slipped out, while at the same time the self-retaining catheter is released and expands so as to fit the puncture in the bladder wall. The catheter is gently withdrawn until the mushroom end impinges on the inner opening of the puncture wound. A stitch may be passed through the skin to steady the catheter if the patient is to be moved. For dressing, a small piece of gauze held by strapping is all that is required. The catheter leads to a urine bottle, and is changed in a week or ten days by stretching it on the stilet and another is introduced. Washing will keep the bladder clean, but if there is difficulty about this it may be postponed until the base hospital is reached, where it can be carried out under surgical conditions. Care in keeping the end of the catheter or extension tube protected and in the urine bottle is an obvious necessity. Reference has already been made to the fact that cystitis without intravesical pressure is not dangerous.

There was never any difficulty in closing the suprapubic fistula if it was desirable. If closure did not take place on the removal of the drain and the institution of constant urethral catheter drainage, this was because of a mass of scar tissue fixing the bladder to the pubic symphysis and the abdominal wall. This fibrous mass was removed by operation, the bladder being completely freed and dropped into the pelvis. Drainage of the mobilized bladder was either suprapubic or urethral for the usual time after cystotomy; then the drains were removed.

Complication of pyonephrosis necessitated nephrectomy in some cases.

A large proportion of the patients, whether with closed bladder and periodic micturition, or with a watertight suprapubic drain, were able to get about in wheel chairs, and their general condition was greatly improved. There were urinary risks from cold and fatigue in these excursions, and attacks of pyelonephritis occasionally resulted, but there was far more gain than loss in the movement and freedom of these patients. ELMER HESS, M.D.

**Zelicovico, Z.: Cystalgia Due to Extracystic Causes in Older Women** (Les cystalgies de cause extravésicale chez les femmes agées). *J. d'urol. méd. et chir.*, 1937, 44: 140.

The author presents a rather extensive review of his experiences in the diagnosis and treatment of vesical irritability or cystalgia, occurring in women between the ages of forty-five and sixty. While the causes of a true cystitis are adequately referred to, the difficult problem lies in those cases in which no definite etiological factors can be demonstrated.

Genital lesions such as bartholinitis, metritis, salpingitis, cervicitis, and prolapses are present in many women and cause vesical symptoms. In the presence of these genital lesions and leucorrheal discharges the vesical symptoms cannot be eradicated. The group of urethral lesions are carefully discussed and believed to be secondary to the genital infections, especially in those women who neglect their hygiene in the menopause. The characteristic

symptoms of a false cystitis are intermittent frequency, urgency of urination, and dysuria. Later symptoms of persistent neuralgia radiating to the level of the coccyx, anus, vulva, and urinary meatus are noted. The bladder mucosa and tolerance are normal. No residual urine is found. General symptoms of nervousness, emotional instability and loss of weight may be present. In searching for a diagnosis a careful gynecological examination should be made, including examination of the Bartholin glands. The urethral lesions to be looked for are infected Skene's ducts, polyps, prolapse and tumors of the meatus, chronic urethritis with polyps or contraction, urethroceles, and diverticula. The latter lesions may be accurately diagnosed by urethroscopy and urethrography. The etiology, pathology, and differential diagnosis of urethral lesions are adequately covered. A rather detailed classification of meatal tumors was recommended.

The preferential treatments of the genital infections and urethral lesions are carefully summarized. All abnormal lesions should be removed or destroyed, preferably with electrosurgery. In some cases no specific gynecological or urinary lesions can be found after a painstaking examination. The cause of the cystalgia remains undetermined. Neurological disorders, such as tabes dorsalis (as cystalgia may be most pronounced in the pretaxic period), multiple sclerosis, compression of the extravesical nerves due to tumors or postoperative adhesions, and suture nerve inclusions, are suggested as possible etiological factors. Cystalgia is most frequently found in women because they have the most favorable conditions for its development. In these cases the local pains tend to unbalance the general nervous system. No satisfactory treatment is known for these cases, although anti-spasmodics may be tried.

LEANDER W. RIBA, M.D.

**Washburn, V. D.: The Treatment of Aniline Tumors of the Urinary Bladder.** *J. Urol.*, 1937, 38: 232.

After summarizing 23 old cases previously reported, the author reports 63 new cases of aniline tumors of the urinary bladder. Of the present group, 39 were single and 24 were multiple tumors, treated by fulguration only.

In 1933, the author reported 11 cases of small single tumor of the bladder which were treated by fulguration only. He now reports 39 additional cases so treated, which make a total of 50. Deducting 2 cases of death from accident or intercurrent disease, 9 cases diagnosed during the past six months, and 3 cases of new primary tumors observed the past three months, leaves a total of 36 cases. Three of the patients in this group of cases are free from symptoms and 33 are free from tumors. Nine have been free from tumor for a year or more, 8 for three years or more, and 4 for four years or more.

Of 15 patients with multiple lesions of high grade malignancy, 6 succumbed. Cystoscopic fulguration, open operation, implantation of radon seeds, together with deep x-ray therapy were employed. The author further expresses the opinion that the tumor was not caused by the irritating carcinogenic agent conveyed to the bladder in the urine, but was carried to the blood vessels of the bladder and exerted its effect on the vessels. He believes that the disease affected the entire bladder and was not limited to a local area. It was decided, therefore, to employ deep x-ray therapy in the treatment of malignant tumors, according to the following technique:

At present, five or six small fields about the pelvis are treated. One hundred roentgens are given to each of two fields daily, with the following factors: 200 kv., 25 ma., 100 cm. target skin distance, with a Thoraeus filter equivalent to 1.5 mm. of copper. The exposure time for 100 roentgens to one field with these factors is about thirteen minutes.

High voltage x-ray therapy is contra-indicated in the presence of urinary obstruction or urinary infection, or when there is any appreciable degree of bladder mucosal congestion.

Table 6 in the original article shows that 9 men were treated by high voltage x-ray therapy. Two patients did not respond, and 2 have had new primary tumors: 1, six months after completion of his course of x-ray therapy; the other, nine months later. The remainder, 5 in number, are free from tumor and at work. In the cases of 3 of the latter patients, a period of thirteen months has elapsed since the courses of x-ray treatment were completed.

The patients with relatively normal bladders, the non-inflammatory group, have been comfortable during the course of x-ray treatment and have been ambulatory.

In the patients with advanced urinary infection, the x-ray technique used not infrequently aggravated the symptoms of burning, vesical tenesmus, and urinary frequency.

From the author's experience with the x-ray technique described, he is of the opinion that there is sufficient devitalization of the tissues to make post-irradiation operative procedures inadvisable. He draws the following conclusions after a review of all cases:

In our group of 86 cases there have been 9 deaths, approximately 10 per cent. Twenty-four (28 per cent) of the patients have been treated recently and 53 (62 per cent) are tumor free.

We venture the opinion that this is a creditable showing, especially when one considers that there were 15 patients with extensive highly malignant lesions.

We feel that it would not be inappropriate to mention the factors which in our opinion have been of major importance in our attempt to solve the problems involved.

It must be recorded to the everlasting credit of the industry involved that full responsibility has been accepted and every facility provided for the discovery of early cases, and nothing has been left undone to restore to health the affected men.

It must also be recorded that the physicians engaged in industrial medicine have provided sound leadership for those intrusted to their care and protection.

Routine cystoscopic examinations of apparently healthy employees instituted by these same men will undoubtedly be the means of saving many lives.

J. Sydney Ritter, M.D.

## GENITAL ORGANS

**Clarke, R.: The Prostate and the Endocrines: A Control Series.** *Brit. J. Urol.*, 1937, 9: 254.

The belief that prostatic hypertrophy as it occurs in man is due to some endocrine abnormality has existed for a long time. The operation of castration and the various Steinach procedures were essentially based on this belief. The recent isolation of the male sex hormone by Butenandt stimulated in many workers in biochemistry and physiology an increasing interest in the endocrine mechanism in the male. Much work has been done by other investigators, but the cause of prostatic hypertrophy is still unknown; however, treatment based on these theories has been suggested. If such therapy could be substituted for surgery, the benefit would be obvious.

There are two different methods of treatment: the logical and the empirical. In connection with the former, the question must be asked: "What is the nature of the evidence that we will require for conviction that prostatic hypertrophy in man is due to a particular form of endocrine imbalance?" The author suggests that an essentially similar disease be produced regularly in suitable animals, either by extirpation of endocrine organs or by replacement therapy, that is, grafting or hormone administration, and that evidence should be forthcoming of the presence of a corresponding increase or diminution of endocrines in cases of the disease in man. At present endocrine estimations can be made satisfactorily only from the urine. It is hoped that methods will be evolved for satisfactory determination of the hormones which are present in the blood or other body fluids. At present no theory of the endocrine cause of prostatic hypertrophy can be said to fulfill such requirements.

In connection with the empirical method, we must ask, "What evidence do we require before applying endocrine therapy generally to this disease in man?" It is suggested that we have evidence of the efficiency of the preparations used, and of the adequacy of dosage and controls.

The author discusses a series of 93 cases of prostatic obstruction that were not treated by surgery. The vital problem to be decided is that of how far we may be justified in replacing surgery by endocrine therapy, or in allowing surgery to be postponed to see what the endocrines can do. The argument that they will do no harm is quite unsound. The postponement of surgery in some cases may allow irreparable damage to occur. Effective endocrine preparations in adequate doses are sometimes very expensive. If effective, they may easily be harmful. At present, cases are being treated with at least two theoretically antagonistic preparations. According to the Cleveland Clinic theory, prostatic hypertrophy is due to a diminution in the testicular output of inhibin. The fat-soluble androsterone and its derivatives are being used elsewhere to produce the same effect. If the inhibin theory is correct, use of this substance would tend to increase rather than decrease the hypertrophy. In the face of such disagreement it must be realized that the newer hormones may be actually dangerous and should be used only under expert supervision. Conclusions as to the efficacy of endocrine treatment, or other new methods of treatment, are valid only if cases are followed for a considerable period of time. The suggested period is five years.

Elmer Hess, M.D

**Shivers, C. H. deT.: New Methods of Pre-Operative Study in Prostatic Hypertrophy.** *J. Urol.*, 1937, 38: 288.

When heart disease complicates prostatism, the degree of improvement is often in direct relation to the vesical drainage. Drainage, either by urethral catheter or suprapubic cystotomy, should be carried out in every case until the surgeon believes the patient is a good risk for further operative intervention. The author does not agree with those authorities who recommend no preliminary drainage in cases of partial retention in which transurethral resection is to be done. Catheter drainage means infection of the urethra and genital tract. The extent of this infection should be controlled by proper care of the indwelling catheter and a bilateral vasectomy which should precede or immediately follow catheter drainage.

The author states that it has been the practice in the Urological Department of the Atlantic City Hospital, Atlantic City, New Jersey, during the last three years, to add to their pre-operative study a routine intravenous urogram and a cystoscopic grading of all prostates, with a consideration of the shortcomings of each procedure. They found that by intravenous urography they could determine with a fair degree of accuracy the presence or absence of renal excretion, the promptness of excretion, the degree of concentration, and the presence or absence of gross changes (hydronephrosis) in the upper urinary tract.

The author strongly advises against retrograde pyelograms in the presence of prostatic hypertrophy, even when it is mechanically possible to introduce ureteral catheters, as there is always great danger of lighting up a latent infection in one or both kidneys. He does not believe that cases showing gross renal changes in the presence of a persistent pyuria should undergo resection even though all other tests are within normal limits. It is this type of case which frequently gets the "resectionist" into trouble. It is not difficult, by means of the renal-function test and blood chemistry, to estimate with accuracy advanced bilateral renal damage, but unilateral changes may

be frequently overlooked in the study of these cases. Cases with upper urinary tract changes, whether they be bilateral or unilateral, respond much better to a two-stage prostatectomy. Urethral drainage does not seem to be adequate and, as the risk is greater, the two-stage procedure is definitely safer.

The author states that since they have added to their pre-operative study intravenous urography and cystoscopic grading, the death rate from infection has been practically nil. Before this routine was adopted they occasionally lost a patient from infection. It is noteworthy that in the pre-operative study these same patients had a normal phthalein output.

HARRY W. PLAGGEMEIER, M.D.

**Bizzozero, E., and Franchi, F.: Lymphogranulomatous Urethritis, Epididymitis, and Orchi-Epididymitis** (Uretriti, epididimiti ed orchiepididimiti poroadenitiche). *Minerva med.*, 1937, 28: 241.

Kleeberg called attention for the first time to the existence of a lymphogranulomatous urethritis. He had observed a thirty-five-year-old man whose urethral pus, adequately prepared, showed marked antigenic properties in patients suffering of lymphogranuloma inguinale.

According to Frei and to others who have observed similar cases, the urethritis was not due specifically to the virus of lymphogranuloma because monkeys inoculated with the urethral pus failed to acquire the disease.

Bizzozero and Franchi have observed 2 cases of epididymitis in which the lymphogranulomatous nature could be easily proved.

The first case was that of a twenty-six-year-old man who has suffered two attacks of gonorrhea complicated by a left epididymitis. He had a positive Wassermann reaction for which he had received eight injections of neoarsphenamine. Subsequent serological reactions were negative. The patient had no complaints except for a slight urethral discharge, but about four years later he suddenly developed fever and pain in the right vas deferens followed by a tumefaction of the homolateral testicle. Following a course of 14 intravenous injections of acridine salts the patient noticed a gradual diminution of the size of the testicle. When seen at the clinic the right testicle was found to be about the size of a bean and of increased firmness. The left testicle was somewhat enlarged and the epididymis was tender. At its site there also was found a smooth nodule of about the size of a bean. A whitish urethral secretion was present. Examination of the fresh sperm revealed a few immobile spermatozoa. The intradermal Frei reaction was found to be positive.

The second case was that of a thirty-three-year-old man who also gave a history of gonorrhea and who, when seen at the clinic, presented essentially the same clinical picture as the former patient. There was also a whitish and not very dense urethral discharge. The Frei reaction was positive. Following treatment with stibional, antimony potassium tartrate, the urethritis improved considerably.

In both cases a neisserian, syphilitic, or tuberculous infection was definitely ruled out. The positive Frei reaction, on the other hand, led the authors to suspect an allergic state of the patients to the virus of lymphogranuloma inguinale.

To prove this, the authors used the urethral secretion as an antigen. After suitable preparation according to Frei's method, this antigen was injected intradermally in 1.10 c.cm. doses in two series of patients: (a) patients with Nicolas and Favre's disease with a known Frei-positive reaction, and (b) patients suffering from gonorrhea or syphilis with a Frei-negative reaction.

The results obtained were very clear and easy to interpret. The antigens prepared from the urethral secretion of both patients produced in all seven patients in the first group definite positive reactions, nodular and erythematous infiltrations from 5 to 6 mm. in diameter, which persisted for over one week. In some cases the original papule was converted into a vesicopustule presenting a central necrosis. The two antigens, on the other hand, produced no reactions in the second group of patients.

After having briefly reviewed the clinical picture and the pathogenesis of this condition, the authors emphasize the necessity of an early diagnosis in order to prevent the development of a suppurative or sclerotic orchi-epididymitis.

RICHARD E. SOMMA, M.D.

**Grevillius, Å.: Malignant Tumors of the Testicle; a Pathological and Clinical Study** (Ueber maligne Hodengeschwuelste; eine pathologische und klinische Studie). *Acta chirurg. Scand.*, 1937, 79: Supp. 48.

There are numerous classifications of the histogenesis and grouping of testicular tumors, but the author supports Ewing's view that all testicular tumors are unilaterally developed teratomas and believes that the seminomas are an independent form of tumor. They have a very typical structure, are relatively slightly malignant, and vary from other malignant tumors in their hormonal relationship. The author's classification of these tumors follows.

1. Tumors of connective tissue (fibromas, sarcomas)
2. Tumors of interstitial cells
3. Tumors of the excretory tracts (adenoma, adenocarcinoma)
4. Tumors of the sexual cells
   a. Seminomas
   b. Mixed tumors
      (1) Mature
      (2) Immature (in which possibly a tissue type which is histologically benign or malignant predominates; the malignant type may be similar to cancer, chorionepithelioma, or sarcoma)
   c. Cancer of the testis
      (1) Simple
      (2) Adenocarcinoma
   d. Chorionepithelioma

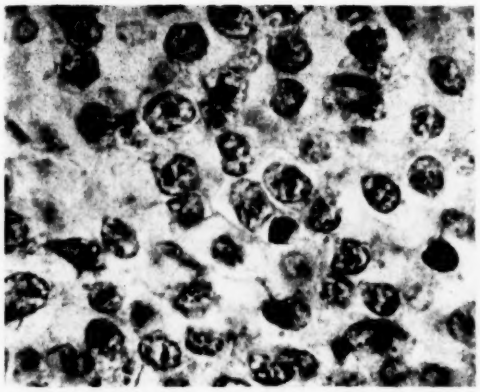

Fig. 1. Seminoma. Large light, polygonal cells which resemble Sertoli cells.

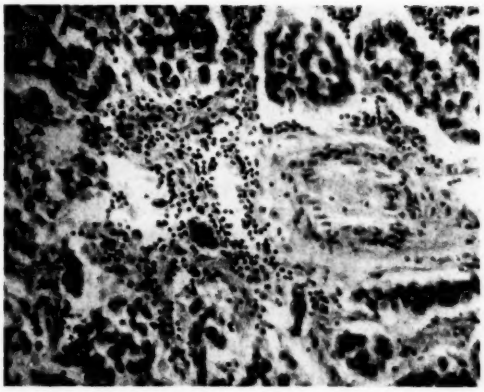

Fig. 2. Seminoma. Alveolar type. Profuse infiltration of round cells.

Even though the author does not deny the possibility that tumors which reveal only one type of tissue, e.g., carcinomatous, may be considered as unilaterally developed teratomas, he considers it logically most correct to classify such tumors as independent forms.

The author's cases include 112 seminomas, 63 mixed tumors, 7 pure adenocarcinomas, 4 sarcomatous tumors, and 3 of uncertain type.

In the case of seminoma the size of the tumors varies from that of a hen's egg to that of a child's head, but it is typical that regardless of the size attained, the normal form of the testis is retained. Occasionally the tunica vaginalis is thickened. In some cases there is a hydrocele, in others the leaves of the serosa may be adherent. The surface of the tumor is generally smooth, occasionally coarsely nodular, but the albuginea is usually intact. An important fact is that the veins in the albuginea are often enormously dilated and form large networks. As long as the tumor remains small, the epididymis often retains its normal form, but with the progress of the malignant process, it is gradually destroyed. The vas deferens is rarely changed. The cut surface is generally homogeneous, smooth, fatty, yellowish-white or yellowish-gray and infiltrated with connective-tissue strands. Occasionally necroses and hemorrhages are seen. Often all the normal testicular substance is destroyed. Microscopically, seminomas are very cellular tumors with characteristic cells, generally round or polygonal, with a large bladder-shaped nucleus and light, weakly staining protoplasm. The nuclei occasionally closely resemble Sertoli cells, also spermatogonia and spermatocytes (Figure 1). This varied appearance is rarely noted in the literature. The cells contain glycogen. The arrangement of the cells is of two types, diffuse and alveolar (Figure 2). Both types may be seen in the same tumor. There may also be syncytial admixtures (Figure 3).

Mixed tumors are almost always congenital. They grow slowly and may reach a considerable size. Malignant degeneration is rare. Usually in the form of a single-layered dermoid cyst, the tumor contains in the solid parts of the wall more or less highly differentiated tissues of various sorts. Macroscopically, it has an irregular form, occasionally containing small nodules and a consistency varying from cartilaginous hardness to fluctuation. The albuginea is rarely involved. The epididymis is usually destroyed, while the vas deferens is rarely infiltrated. There are numerous small cysts, and cartilaginous areas are visible to the naked eye. Necroses and hemorrhages are common especially when chorion-epitheliomatous areas are present. Microscopically, there are mixed among one another the most varying kinds of tissue. These different kinds of tissue may appear benign or malignant. Epithelial tissue is abundant. The squamous epithelium may appear

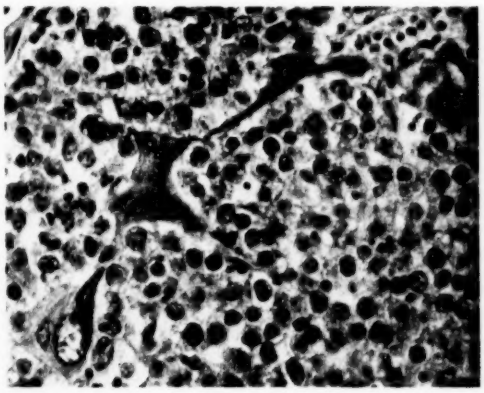

Fig. 3. Seminoma. Syncytial formation. a. Giant cell.

as solid cell strands and pile up, possibly with central hornification, or it may fill the cyst walls in layers and tube-shaped structures. Both squamous and cylindrical epithelium and transition forms may occur in the same cyst. Glia tissue is often present. The connective tissue is distributed between the epithelial bands, often being of the embryonal type. Myxomatous tissue is seen also. Cartilage is often found, either in the form of small islands or constituting large parts of the tumor; most often it is of hyaline and sometimes of the embryonal type. Bone tissue is seen. Smooth muscle is usually present. The tumors are generally very vascular. Pigmentation results from the rupture of the thin-walled blood vessels.

Atypical malignant proliferations of varying extent are often present. There are also simple undifferentiated cancer types, as well as adenocarcinomatous formations. Chorionepithelioma-like formations are another form of malignant proliferation in testicular tumors. They have two components, syncytial and so-called Langhans cells. The connective-tissue elements occasionally show polymorphous proliferation resembling sarcoma. Pure testicular tumors are rare. The sarcomas may be of the spindle-cell or the round-cell type.

Seminomas may produce an increased excretion of follicle-stimulating hormone; while the mixed tumors produce an increased excretion both of the latter and of luteinizing hormone. The cases in which an increased hormone excretion persisted in spite of operation and roentgenotherapy all ended fatally; whereas in the cases that showed no increased hormone excretion recovery took place. Hormone tests are, therefore, of great importance prognostically. From the diagnostic standpoint, the positive reaction of the anterior pituitary lobe in the presence of testicular affection makes the presence of a malignant tumor most probable. A negative reaction has no significance.

Testicular tumors are quite rare. Among a series of 2,752 patients with malignant tumor in males, 36 had testicular tumors. Before the twentieth year of life these tumors are very rare, but after that the frequency does not vary much at different ages. In many cases the patient mentions trauma as the cause of the tumor, but in no case could such a statement be proved. Nevertheless, it is possible that a hemorrhage may occur more readily in a tumor than in a normal testicle and therefore a slight trauma may produce a hematoma, which attracts the patient's attention.

A retained testicle is attacked by malignant degeneration considerably more often than one in the scrotum. In the author's cases retention was found in 6.5 per cent. In 4 of these the testicle had not descended. It is suggested that operation should be done in such a way that the testicle does not remain hidden postoperatively, but is subject to control.

As to the general symptoms, seminomas usually develop more slowly than mixed tumors. The probable duration of disease for the fatal seminomas was eighteen months and for the lethal mixed tumors eleven months. The latter indicate their greater malignancy by the fact that the metastases occur earlier and lead to death more rapidly. One patient revealed a gynecomastia, a true hypertrophy of the mamma, with colostrum formation. Such cases are rare. The symptoms of seminomas and mixed tumors are about the same. The great importance of the earliest possible diagnosis is emphasized, as well as the value of the hormone analysis.

The following were the results of treatment after four years and more:

After simple extirpation, $59 \pm 7$ per cent of 49 patients with seminomas, and $35 \pm 8$ per cent of 34 with mixed tumors were living; after extirpation of the testicle plus roentgenotherapy, $59 \pm 6$ per cent of 39 with seminomas and 15 per cent of 13 with mixed tumors were living. Some of the cases of seminoma with metastases were saved by irradiation; in some the improvement was only transient, while in others the irradiation was unsuccessful. The mixed tumors were almost insensitive to irradiation. However, postoperative irradiation therapy should be given in every case, but pre-operative irradiation therapy is contra-indicated according to the author. The best treatment for malignant testicular tumor is extirpation of the tumor as soon as the diagnosis is made, even though metastases are present. After that, repeated postoperative roentgenotherapy should be given. Repeated follow-up examinations, including hormone analysis of the urine, should be made.

The prognosis depends upon the timeliness of operation and the type of the tumor. The seminomas showed a mortality of $42 \pm 5$ per cent. Because of their great radiosensitivity the prognosis is not absolutely hopeless, even with metastases. In the cases of immature mixed tumors the mortality was $64 \pm 7$ per cent, and in those with metastases the prognosis was the worst. Hormone analysis gives important prognostications. If the amount of excreted hormone increases in spite of operation or irradiation therapy, the prognosis is bad, whereas a decreased excretion is a good sign. Cases of mixed tumor usually show metastases within a year after discovery. Since metastases of seminomas may appear years after operation, the patients operated upon for seminoma should remain under control for a period of several years following the operation.

LOUIS NEUWELT, M.D.

# SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

## CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

**Pereira, S.: Reversal of the Epiphyseal Cartilage and Its Effect Upon the Process of Endochondral Ossification and Bone Growth** (Le renversement du cartilage de conjugaison et son influence sur le travail d'ossification enchondrale et la croissance de l'os). *Lyon chir.*, 1937, 34: 513.

After briefly reviewing the normal process of endochondral ossification, the author reports the results of his experiments with rabbits from six to eight weeks old in which he operatively reversed the epiphyseal cartilage of the lower end of the ulna.

In analyzing the results of his experiments the author found that following isolation and reversal or autotransplant of the epiphyseal cartilage into the diaphysis of the bone, endochondral ossification proceeds at a normal rate. The cartilage conserves the direction and the general plan of its activity as before the intervention. Reversal of the cartilage does not alter these conditions in the least.

However, isolation, and reversal or autotransplant produce modifications in the epiphyseal cartilage which influence endochondral ossification, and consequently the bone growth, in longitudinal direction. Following isolation of the epiphyseal cartilage of the lower end of the ulna, a slight decrease in length (about 1 mm.) results seven or eight weeks after the operation. This increases (from 3 to 5 mm.) a few months later, at the end of bone growth.

Concerning the morphological modifications of the epiphyseal cartilage following its isolation, the author observed during its growth a slight irregularity in the orientation of the columns of chondroblasts. At the end of growth the bone replacing this abnormal cartilage could not be differentiated from normal bone.

Following the reversal of the epiphyseal cartilage, either alone or combined with adherent bone spicules, the cartilage was always pushed toward the epiphysis which produced a bony segment of a length varying from 2 to 6 mm. In all cases the ulna underwent a shortening of not more than 6 mm. during the period of from four to eight weeks following the reversal of the cartilage. During the following months this shortening increased to from 8 to 18 mm.

Reversal of the cartilage did not affect endochondral ossification. The diaphyseal face of the cartilage which normally presents the greatest cellular activity showed the same intense activity when turned toward the epiphysis as in its original position. During the first few weeks following reversal, the cartilage presented an almost normal structure but in the following weeks the process of endochondral ossification became more irregular and its activities were diminished. From two to four months following the reversal, the cartilage had lost almost completely the power of producing bone. Its architecture, however, remained unchanged, and it was surrounded by bone marrow. At the end of growth, the resulting bony lamellæ replacing the reversed cartilage were found to be normal in every respect.

Following transplantation of the epiphyseal cartilage into the diaphysis of the bone either in normal position or by reversal, growth did exceed 3 mm., but the total shortening of the ulna varied between 7 and 15 mm. Similarly, reversal of the epiphyseal cartilage which had been grafted into the shaft of the ulna did not influence the process of endochondral ossification. The author observed only a diminished activity in the cartilage, but bone formation occurred more rapidly. It is evident that the location of the graft plays an important rôle in the growth of the epiphyseal cartilage and therefore also in the lengthening of the bone.

RICHARD E. SOMMA, M.D.

**Kaplan, L., and Ferguson, L. K.: Bursitis.** *Am. J. Surg.*, 1937, 37: 455.

Bursæ contain a synovial-like fluid which permits movements of one tissue over another with a minimum of friction. They are developmental in origin and appear in response to a functional demand.

Bursæ may be divided into two groups, the superficial and the deep. Superficial bursæ lie between the skin and the bony prominences, while the deep bursæ lie between muscle and the moving bony points.

The superficial bursæ are the olecranon, the prepatellar and the one over the head of the metatarsophalangeal joint. Their diseases may be divided into acute (traumatic, suppurative), subacute, and chronic bursitis.

In acute traumatic bursitis there is a history of trauma with the subsequent appearance of tenderness and distention of the bursa. Treatment by immobilization prevents further injury, decreases pain, and makes for early subsidence of the acute symptoms. Cold applications are used for the first two or three days, after which, heat may be of value. Aspiration of a fluctuating sac will give relief and shorten the course of the inflammation. Protection of the area against subsequent trauma is important.

In acute suppurative bursitis splinting, rest, and hot wet dressings are advocated; incision and drainage may be indicated later if the initial treatment fails.

In subacute and chronic bursitis frequent mild trauma usually causes the condition and the resultant formation of fibrous tissue. The treatment consists of obliterating the sac completely by injecting some sclerosing solution into the bursal cavity after aspiration of the contained fluid. The sclerosing solutions suggested are sodium morrhuate,

Fig. 1. Calcification in the floor of the subacromial bursa. Note how little of the calcified deposit is visible in the view at the left as compared with that on the right, taken after rotating the arm.

tincture of iodine, or a solution made up of phenol, borax, salicylic acid, glycerin, and spirits of camphor.

The deep bursæ are the subacromial, subgluteal, iliopsoas, supratrochanteric, semimembranous, and pretibial. The diseases of these deep bursæ may be divided into acute (traumatic, calcification), subacute, and chronic bursitis.

Acute traumatic bursitis is usually due to a direct injury to the bursa or adjacent structures. The treatment is primarily by immobilization.

In acute bursitis due to calcification, the cause of the pain is the tension in an area of calcification. In the case of subacromial bursitis the humerus should be rotated into two or more positions in order to demonstrate the mass with the roentgen rays.

Two methods of treatment are suggested:

1. Incision of the bursa under local anesthesia to allow the bursal contents to escape. The relief of tension gives immediate subsidence of pain.

2. Aspiration of the calcified material and irrigation of the area. Disability rapidly subsides and complete function may return in three or four days.

In subacute and chronic bursitis the pathology may simply be post-traumatic, or due to slight calcification with roughening of the floor of the bursa. Atrophy of the adjacent muscles may be noted when this condition has continued for some time. Open operation as a rule gives disappointing results. The treatment which gives most consistent good results is the injection of local anesthesia into the bursa before manipulation, followed by exercises, heat, counter-irritants, gentle massage, and the use of analgesics if necessary.

Inflammatory lesions of the deep bursæ, other than the subacromial, are uncommon.

RICHARD J. BENNETT, JR., M.D.

**Meulengracht, E., and Meyer, A. R.: Osteomalacia of the Spinal Column.** *Acta med. Scand.*, 1937, 92: 584.

Nutrition experiments have shown that osteomalacia and the closely related rickets are derangements of the calcium and phosphorus metabolism due to deficiency of Vitamin D. This metabolic disturbance causes inhibition of physiological bone regeneration and deficient calcification of newly formed bone tissue, resulting in halisteresis and osteoporosis of the skeletal system. The blood phosphorus concentration is reduced while the blood calcium may be normal or diminished. A negative calcium balance is found in advanced cases. The modern conception of osteomalacia as the result of deficient nutrition has also thrown some light upon some clinical pictures, the connection of which with osteomalacia has long been problematical.

Osteomalacia attacks especially women during or after pregnancy, and results in enormous bone deformities, but it may also occur in non-pregnant women and even in men with characteristic involvement of only the spinal column and ribs, while the bones of the pelvis and extremities escape. The same characteristics apply to senile osteomalacia, and its differentiation from osteoporosis has been disputed. These types of osteomalacia are more common than is generally supposed, as was shown in the years after the World War, when the so-called "hunger osteomalacia" appeared in Austria and Germany, with the spinal symptoms often very pronounced. Osteomalacic changes are an integral part of the clinical picture of hunger osteopathy. Severe cases of osteomalacia, which apart from affection of the spine also showed characteristic pelvic lesions, have recently been observed in Denmark.

Four of the author's cases are reported. In the first case a woman, aged fifty-eight years, developed thoracic kyphoscoliosis with pains in the shoulder, back, and loin. Roentgenography showed pronounced halisteresis of the spine and collapse of several thoracic vertebræ. Treatment with Vitamin D and calcium quickly produced a striking subjective improvement. Interruption of the Vitamin D treatment caused a recurrence of the subjective symptoms.

In the second case, that of a man aged forty-two years, the patient developed severe pains in the back after a deficiency diet for "dyspepsia" for five years. Roentgenography revealed extensive destruction and collapse of thoracic and lumbar vertebræ and shortening of the trunk. Repeated roentgen-ray treatment for supposed multiple myelomas had no effect. On a complete diet with Vitamin D and calcium, the pains disappeared and the progress of the bone lesions was arrested.

The third case was that of a seamstress, aged sixty-four years, who lived mainly on a vegetarian diet, including milk products. She had pain in the loin, radiating down the leg. Roentgenography revealed halisteresis of the spine with hourglass vertebræ. On treatment with full diet and Vitamin D and calcium, the subjective symptoms disappeared. Omission of Vitamin D and calcium did not affect her condition, but the pain recurred when milk was discontinued.

In the fourth case, that of a woman, aged seventy-seven years, who was living on an inadequate diet, severe lumbar pains occurred. The spine showed halisteresis and hourglass vertebræ. Under administration of Vitamin D and calcium the subjective symptoms rapidly disappeared.

Even in countries where osteomalacia is considered to be very rare, a syndrome closely resembling osteomalacia clinically and etiologically is found. In the early stages the symptoms are not characteristic. The pains are considered "rheumatic," and ineffective physical therapy is given. Its failure alone gives a hint of the diagnosis. The fact that the disease not only starts in the spine but remains localized there, so that advanced deformity and destruction of the spine may occur without implication of other skeletal parts, is at variance with the prevalent clinical conception of osteomalacia.

Even in the early stages of this disease roentgenography reveals osteoporosis of the skeletal system, either general or far advanced in the spine. As the disease progresses, a characteristic excavation of the superior and inferior surfaces of the vertebral bodies appears, giving the appearance of an hourglass in the lateral view. Soon destructive processes lead to vertebral collapse and spinal deformity. However, none of these changes are characteristic of osteomalacia alone. Hyperthyroidism, often starting with pain in the extremities and difficulty in walking, may in its early stages show generalized osteoporosis and only later multiple, cystic lesions characteristic of this disease. A disturbed calcium metabolism is also found in hyperparathyroidism, but while the serum phosphorus values are reduced in both osteomalacia and hyperparathyroidism, in the latter there is characteristic hypercalcemia. The differential diagnosis between the two diseases may be difficult when the blood changes are not definite. Necropsies in osteomalacic cases usually show moderate hyperplasia of the parathyroids, which is considered as a compensatory measure to counteract the disturbed calcium metabolism in osteomalacia.

Primary and secondary tumors of the spine must also be differentiated. The primary stages of multiple myelomas may cause spinal pain and osteoporosis alone; the advanced stages may also recall osteomalacia, but systematic roentgenography will reveal multiple destructive foci, especially in the cranium, characteristic of myelomas.

It may be difficult to distinguish osteomalacia from senile osteoporosis in old patients, especially when the senile bone atrophy is manifested not so much by increased fragility of the bones in the extremities as by the spinal deformity. The relation between the two clinical pictures is still under discussion.

Although it is established that a deficient diet plays a decisive rôle, several etiological points are still undecided. The hunger osteomalacia after the World War was often preceded by undernourishment from a diet deficient in calories. However, this is not a necessary factor of the disease for not all famines are followed by osteomalacic symptoms. Moreover, a diet deficient in calories usually is defective in other respects, such as Vitamin D or calcium, or both. Vitamin D is absent in vegetables and cereals. It is important as it causes an increased retention of calcium and phosphorus in the body. A pure Vitamin D deficiency need not, however, produce morbid changes. Reduced or inadequate content of calcium and phosphorus is a further requirement for the development of osteomalacia. Recent animal experiments indicate that the latter condition alone, without a Vitamin D deficiency can produce the pathological changes. It seems that the absorption and assimilation of calcium salts is the crux of the problem. For their absorption not only must the quantity and relative proportion of calcium and phosphorus in the food be favorable, but local conditions in the small intestine also play an important part. For example, an increased alkaline reaction or a larger quantity of free fatty acids may retard or prevent calcium absorption by forming insoluble calcium compounds. Hence, morbid conditions leading to such changes in the intestine may show signs resembling osteomalacia. However, even in true osteomalacia, such endogenous factors may cause the disease; therefore, osteomalacia cannot be regarded as being due to a single definite dietary deficiency, but a combination of such deficiencies.

All 4 of the author's patients suggested malnutrition from a calory-deficient diet, but it was certain in only one, who was on a very strict diet for five years. All of the patients showed a deficiency in

Vitamin D, and 3 showed a deficiency in calcium. Milk, an important source of calcium, was practically omitted from the diet of these 3 patients. This deficiency occurs more easily with unbalanced diets, as there is only a small surplus of calcium in the normal diet.

Probably some of the factors known to be causative in osteomalacia were operative in the author's cases, but it is not impossible that other nutritional deficiencies contributed to the pathological changes. The diets responsible for the hunger osteomalacia following the World War were deficient not only in vitamins and mineral salts, but also in proteins and fats. Hence the term "deficiency bone disease" is preferred by some authors to osteomalacia. The clinical picture resulting from unbalanced diets may be a combination of syndromes dependent on nutrition. There may be a tendency to edema with the bone changes in hunger osteomalacia. The authors report a case showing a combination with scurvy, in which the scorbutic symptoms dominated the picture. Therefore, the development of spinal osteomalacia should lead to the search for these changes whenever the dietetic history indicates. The authors prefer the term "osteomalacia of the spine" whenever a spinal disease due to faulty nutrition conforms closely with the clinical, therapeutic, and etiological aspects of the classical forms of osteomalacia. LOUIS NEUWELT, M.D.

**Ober, F. R.: The Relation of Fascia Lata to Conditions in the Lower Part of the Back.** *J. Am. M. Ass.*, 1937, 109: 554.

A survey of 415 patients with lame back and sciatic pain was made to determine the value of division of the fascia lata above the trochanter. Complete relief was obtained in 75 per cent of the cases; partial relief in 4 per cent; and no benefit in 21 per cent. The operation is indicated in cases of low back or sciatic pain if the normal lumbosacral angle is increased or decreased. The contracted fascia lata may exert an abnormal pull on the pelvis and disturb the mechanics of the whole spine.

The operation is contra-indicated if roentgen-ray evidence of abnormality of the spine exists. Fasciotomy should not be done unless all the special tests show the fascia to be contracted. Sciatic pain is not a prime indication for operation until pathological changes of the spine, spinal cord, or sciatic nerve have been ruled out. The author is unable to state whether the mechanical distortion of the spine causes sciatic pain, or whether the pain results from pressure of spastic muscles of the posterior hip-joint region. JEROME G. FINDER, M.D.

**Callen, H. S.: Pellegrini-Stieda's Disease: A Manifestation in the Knee of Post-Traumatic Changes Common to Other Joints.** *Radiology*, 1937, 29: 158.

Pellegrini and Stieda, independently, and at about the same time, called attention to a calcification or ossification of the tibial collateral ligament occurring after trauma. Numerous reports of the so-called Pellegrini-Stieda disease have since appeared in both the European literature and that of the United States.

Even in the literature of the so-called Pellegrini-Stieda disease it is reported that other structures about the knee joint rather than the tibial collateral band are involved, viz., the tendons of the adductor magnus and vastus medialis. Changes in subdeltoid bursitis are similar as they are due at times to ossification. Myositis ossificans also has similar deposits, and in this condition, as in Pellegrini-Stieda's disease, recurrence of the pathological process has been found after too early surgical intervention.

Ossifications have also been found to occur about joints in some cases of paraplegia after rough handling. Attention is called to the impossibility of roentgenographic differentiation between calcification and osseous deposits in the absence of trabeculation. Histological examination of these deposits is necessary to determine exactly whether the process is one of calcification or ossification. Some of these deposits will disappear spontaneously or after physical therapy, while in other instances such deposits persist in spite of medical treatment.

Fatty degeneration which is thought to precede calcification is suggested as a cause for the delay in the appearance of roentgen-ray findings after injury. It may be that ligaments and tendons tend to acquire inclusions of primitive mesenchymal tissue destined to form bone, which lies dormant until stimulated by trauma.

Hence, the authors believe that Pellegrini-Stieda disease is not truly a disease entity but merely a local manifestation in the knee of post-traumatic changes common to all joints.

HAWTHORNE C. WALLACE, M.D.

**Ragnotti, E.: Angioma of the Articular Capsule of the Knee** (L'angioma della capsula articulare del ginocchio). *Arch. ital. di chir.*, 1937, 46: 189.

Of 1,674 cases of angioma studied by Stewart and Bettin in 1924, only 9 per cent were localized to the lower extremities, and of these only 10 cases were in the knee joint.

The author reports the case of a laborer, aged thirty-six. In 1917, at the age of sixteen, while attempting to rise from the squatting position he felt a severe pain in the left knee, which confined him to bed for the next five days. Some pain persisted in the knee or the inferior medial border of the patella. During the war, long marches aggravated the condition. In 1927 an exacerbation of pain occurred. On December 5, 1936, the patient entered the clinic with a diagnosis of arthritis of the knee. The local findings were essentially a globular swelling of the knee with some atrophy of the thigh muscles. On the medial side of the patella an olive-sized elastic swelling was present. There was a slight limitation of flexion. Roentgen-ray findings were negative. Pneumarthrosis revealed no pathological changes in the roentgenogram.

On December 11, 1936, Donati operated on the patient. Through a transverse medial incision a polypoid mass was found in the interarticular space. The medial meniscus was normal.

The tissue removed measured 2 by 3 cm. Microscopic section revealed a great many cavernous sinuses filled with blood and lined with endothelium. A pathological diagnosis of a cavernous angioma of the articular capsule of the knee was made.

The patient made an uneventful recovery.

The author presents in abstract 22 cases of the same disease collected from the literature from 1893 to 1937. He takes up the symptomatology, the differential diagnosis, and histopathology in detail. He also discusses trauma as a causative factor, in which he very definitely believes.

CARLO S. SCUDERI, M.D.

## FRACTURES AND DISLOCATIONS

**Meyerding, H. W.: The Treatment of Acromioclavicular Dislocation.** *Surg. Clin. North Am.*, 1937, 17: 1199.

Physicians who treat injuries of the shoulder must bear in mind the importance of differentiating between partial and complete dislocation of the acromioclavicular joint.

Immediately following separation of the acromioclavicular joint, the patient will complain of pain over the shoulder and disability. Inspection will disclose an obvious deformity. If there is a separation of 1 in. or more, it indicates that a rupture of the coracoclavicular ligament has occurred. In such a case, complete separation may be diagnosed. Later, swelling obscures the deformity, and palpation may be difficult and painful. Routine roentgenological examination should be made in every case in which there has been an injury to the shoulder; anteroposterior and transaxillary roentgenograms should be made to determine the exact extent of the displacement and to rule out fracture.

Litigation, insurance, and compensation frequently demand that the physician have a knowledge of the time and type of injury, the clinical and roentgenological findings, the treatment employed, and the results in terms of function.

When emergency treatment is given some distance from a hospital or the physician's office, a supporting sling or fixation with adhesive tape is advisable during transportation. This should be removed during physical and roentgenological examination. The proper course of treatment can be determined after a final diagnosis has been made.

Should the findings disclose an incomplete dislocation, the arm should be supported by a sling, adhesive tape, or plaster cast. The surgeon should make sure that the arm is pulled upward and backward and thus maintained throughout the period of fixation, which should be three weeks. The dressings should be observed daily, if possible, to make certain that displacement of the clavicle has not occurred.

Fig. 1. Complete dislocation of acromioclavicular articulation with rupture of capsular ligaments and the extra-articular coracoclavicular ligaments.

Operation has not been found necessary unless some interference with reduction has occurred.

Recent complete dislocations usually may be reduced readily. Suture or fascial fixation of the acromioclavicular joint in the presence of complete dislocation is inadequate, and some form of reconstruction of the coracoclavicular ligament is necessary. If these two operations are combined and adequate postoperative support is maintained, the results are most gratifying. Arthrodesis of the acromioclavicular joint limits the function of the shoulder; therefore it is not advised. Nailing or wiring through the joint produces traumatic arthritis. The use of wire, silk, or rubber tubing has been successful, but fascial transplants are preferable.

Meyerding prefers to use fascia lata as a reconstructive material; it is an autogenous tissue which lives, does not cut out, and does not cause irritation. It may be used as an envelope and sutured about the acromioclavicular joint as a capsule, and passed through bone under or above the joint to reconstruct the superior or inferior acromioclavicular ligaments. Some increased strength is obtained by repairing these ligaments in addition to the coracoclavicular ligament. In repairing the acromioclavicular ligaments, drill holes not larger than from 1/16 to 1/4 in. are preferable.

Excellent exposure for repair of a complete dislocation may be obtained by the use of a curved incision which begins at the acromion and extends over the clavicle and downward mesially to the coracoid process of the scapula. The acromioclavic-

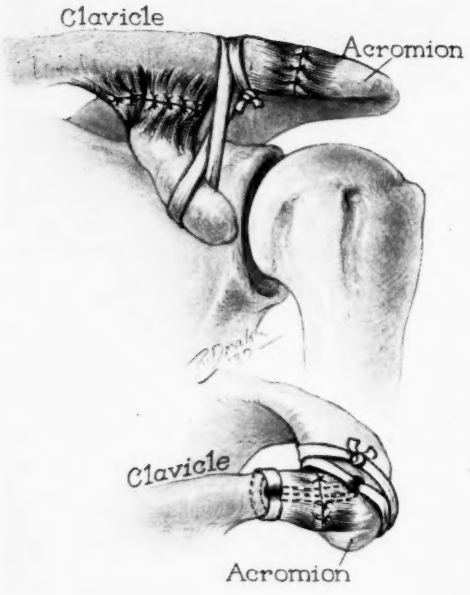


Fig. 2. Acromioclavicular dislocation reduced; strips of fascia lata used to reconstruct ligamentous support, and fascial transplant used to reconstruct coracoclavicular ligament.

ular joint is exposed by a dorsal incision carried well over the clavicle, and with a sharp periosteal elevator the attachment of the deltoid muscle is separated so as to leave spicules of bone attached. By separation of the deltoid muscle from the pectoralis major muscle, the cephalic vein and deltoid muscle may be retracted outward to expose the coracoid process. To repair the coracoclavicular and acromioclavicular ligaments, two strips of fascia lata are necessary. Silk sutures are used to fix the fascia as it crosses on the dorsum of the clavicle; they are passed through the knot in the fascia lata, in order to prevent slipping. The ends of the coracoclavicular ligament may be freshened and sutured. The torn acromioclavicular ligaments are repaired by using the narrow strips of fascia lata, which are looped around the distal end of the clavicle and the two ends passed downward through a hole ¼ in. in diameter, and under the acromioclavicular joint, so as to emerge through a similar drill hole in the acromion. The fascia is pulled tight, passed under the acromion, tied above the acromion, and the knots are sutured. By freshening the ends of the capsular tissues and suturing them, further strength is secured. Wounds are closed without drainage, and gauze dressings, moistened with 70 per cent alcohol, are applied and held in place with adhesive tape.

Care must be taken to maintain the reduction and not bring undue strain on the fascial support while external fixation, casts, splints, and bandages are being applied. Plaster of Paris should be applied so as to hold the clavicle down and the arm and shoulder up. The arm should be held in corrected position until the plaster hardens. Fixation is maintained for from six to eight weeks. Physical therapy is then employed. Good results usually are obtained within three months after the operation.

**Zollinger, F.: Isolated Spinous-Process Fractures, with Special Consideration of the Muscle-Traction Fractures—Schipper's Disease** (Isolierte Dornfortsatzbrueche mit besonderer Beruecksichtigung der Muskelzugfrakturen, Schipperkrankheit). *Schweiz. med. Wchnschr.*, 1937, 1: 485, 505.

Spinous-process fractures are by no means rare. The author reports 78 cases which were caused solely by muscle traction. In addition to these, he is acquainted with a considerably smaller number of cases caused by a circumscribed contusion or an abrasion, as from sudden excessive bending of the vertebral column. Those most frequently affected are hod-carriers and handy-man laborers in building trades. The preference for youthful laborers for these jobs may be a constant factor. A relatively large number of fractures occurred during shoveling. In the smaller group of cases an accident complying with compensation insurance was demonstrable. Most of the patients carried occupational indemnification. The author's experience does not confirm the belief that most of the injured are laborers not accustomed to hard excavation or earthwork labor.

In the majority of cases the tearing fractures were manifested by such violent splitting pains between the shoulder blades that work had to be discontinued immediately. Very infrequently the pain gradually increased. Sometimes sudden crackling, crashing, or crunching occurred. The pain did not correspond with the site of the fracture or injury. The cervical spine was held surprisingly rigid. Not infrequently a downward displacement of the fractured end of the spine could be seen or at least palpated. Lateral movements and fine bony crepitus confirmed the diagnosis. The anterior roentgenogram showed a triangular light zone. Lower down and somewhat lateral to the midline, a contrast streak was noticed; it appeared as a sharply defined dark ring, the outlines of which corresponded to the level of the fracture and of the broken spinal segment. Oblique views sometimes aided in the diagnosis, but were not essential. Often only one vertebra was involved, generally the first thoracic. If no neurotic complications occurred, the symptoms diminished in a few days and gradually disappeared. As a rule the healing occurred as a pseudarthrosis, or by means of a connective tissue bridge. The disability lasted from one to nine weeks, averaging twenty-eight days.

In the treatment it is of greatest importance not to disclose the true diagnosis to the patient as the

term "vertebral fracture" always makes an alarming impression and interferes with the determination to get well. One should merely mention muscle rupture and attach little or no importance to the injury. The muscle-traction fracture of the spinal processes is the most frequent and at the same time the least harmful fracture of the vertebral column, provided the patient is ignorant of the true diagnosis. It is caused by the disturbed coördination of the different muscles arising from the vertebral spines; the trapezius is most often involved.

The patients are definitely entitled to compensation insurance provided the fracture follows an accident. If the rupture occurs in the course of the lifting of weights not excessive for the strength of the laborer, or during ordinary shoveling, then also the patient should be compensated legally, but the cause is a muscle fatigue due to the monotony of occupation.

(A. Brunner). Mathias J. Seifert, M.D.

**Rankin, L. M.: Fractures of the Pelvis.** *Ann. Surg.*, 1937, 106: 266.

This is a statistical study covering 449 cases from 4 hospitals. Multiple fractures occurred more often than single fractures.

The treatment of choice was the use of an overhead suspended hammock with traction to the legs and early physical therapy.

There were 40 deaths and 46 different kinds of complications. There were 6 cases of ruptured bladder.

The average period of total disability in uncomplicated cases was sixteen and four-tenths weeks, and before return to regular work twenty-three and six-tenths weeks. Daniel H. Levinthal, M.D.

**Hey Groves, E. W.: The Modern Treatment, and Results of Treatment of Fractures of the Neck of the Femur.** *Brit. M. J.*, 1937, 2: 359.

The author describes the introduction of the Smith-Petersen nail, in 1929, and how its introduction has changed the attitude of those who treat this type of fracture. He states that "zeal has outrun discretion, and extravagant claims are made which may lead to disillusionment later." He describes the advantages and disadvantages and hopes that when statistics are published, they may show success in 75 per cent of the cases. The saving in the amount of suffering and invalidism, and the more rapid recovery is considered.

Three methods of insertion of the Smith-Petersen nail are described, (1) the open operation, (2) blind insertion over wire guides, and (3) blind insertion with the help of a mechanical director.

The open operation with its Watson-Jones modification gives accurate reduction and placement of the nail, but it takes nearly an hour; there is loss of blood and a wide exposure, which the author believes is unjustifiable in the old and feeble patients.

The blind insertion of the nail over wire guides, described by Johansson, Jerusalem, and King, has two great drawbacks: (1) it involves an anesthesia of one or two hours, and, (2) it requires taking and interpreting many films.

Hey Groves uses his mechanical director, which is a pronged guide; one prong touches the middle of the head of the femur and the other the base of the femoral neck. This gives the axis of the neck. A short incision is used; the operation is bloodless and is done under gas-ether anesthesia in from ten to fifteen minutes.

The writer permits his patients to be up in a week with crutches and to bear weight in six weeks. The nail is removed three months after its insertion.

The late cases with non-union may be treated by the bifurcation osteotomy, Schanz's cuneiform osteotomy, or the Whitman reconstruction operation.

Daniel H. Levinthal, M.D.

**Maddock, S., and Jensen, D.: The Treatment of Septic Compound Fractures of the Tibia with Maggots.** *New England J. Med.*, 1937, 217: 123.

The authors report the results of the treatment of 44 cases of septic compound fracture of the tibia with maggots. No cases are included in which treatment was begun after September, 1936. They divide their infected compound fractures into several groups:

In the first are cases of acute sepsis with avulsion of the soft tissues. In these treatment may be started immediately upon control of the gross bleeding. As soon as the splints are applied the larvæ are placed in the wound and the area covered with gauze fluffs and cellucotton. The dressing need not be changed for forty-eight hours. If the infection is severe enough to require amputation, the leg will be kept sufficiently clean to permit this operation at an optimum time.

The second group consists of cases of acute sepsis without avulsion. Most of these cases were originally treated by débridement and primary suture. When infection became apparent the sutures were removed and Dakin's solution or warm fomentations were used. If the infection did not then show signs of subsiding, maggot treatment was begun. Bands or plates were allowed to remain in position as long as they fulfilled their function.

In the third group the cases presented acute sepsis following open operation. The stitches were removed and maggots implanted in the wounds. Bone grafts, bands, or plates were not removed until they ceased to be useful.

In the last group the cases presented chronic sepsis. They were treated with maggots for at least three or four weeks before operation. During this period some healed or at least showed that there was no bone involvement. These cases were then treated with skin grafts. In the event of true bone involvement the maggots tended to demonstrate its location, and it was not unusual to find that this area did not correspond with the roentgen-ray or clinical findings. After the period of study and treatment with maggots a typical effacement operation was

performed; the wound was packed with vaseline gauze, and a cast was applied.

Finally, there was 1 case of traumatic amputation. In this case maggots were applied immediately.

In acute cases with avulsion and in chronic cases the maggots were placed in the wound with sterile swabs without any preliminary measures. In acute cases without avulsion or in postoperative infections the wounds were irrigated with a 1:50 dilution of tincture of iodine in 0.9 per cent sodium chloride. The wound was then irrigated with a sterile, about 0.25 per cent, suspension of calcium carbonate, and the maggots were applied.

Enough maggots were applied to cover comfortably the surface of the wound. After experimenting with various types of cages it was found that the best results were obtained by packing the wounds lightly with gauze after inserting the maggots. The entire wound was then covered with fluffed gauze held in place with bandages. Cellucotton pads were then placed over the dressing.

Maggots reach full growth in two or three days. Dressings were changed daily or every other day, and a fresh supply of larvæ added on all cases which were in the hospital. The full-grown maggots crawled out of the wound to pupate and were caught in the gauze and easily removed. It was important to keep the exposed bone, fascia, or muscle from drying. This can be done by covering the areas with glucose or urea crystals. As soon as the entire surface responds with healthy granulations the wound should be prepared for skin grafts by warm soaks or Dakin's solution.

Of the 44 patients treated, 32 presented healed lesions, 4 are under treatment, 1 was lost, 5 underwent amputation, and 2 died. The deaths were due to general septicemia. The amputations were performed because of gross loss of bone and soft parts in 3 cases, because of choice in the presence of nonunion, and because of malignancy.

The time of treatment with maggots varied from twenty-five to one hundred and thirteen days, and the total time of treatment from one hundred and sixty to seven hundred and forty-three days.

The advantages of maggot treatment are the rapid débridement of necrotic material, the discovery of hidden sequestra and pus pockets, shortening of the hospitalization, and early rehabilitation. Chronic suppuration following infection of compound fractures or open operation should not occur. An adequately treated septic compound fracture of the tibia once healed stays healed.

HAWTHORNE C. WALLACE, M.D.

**Bode, P.: Fracture of the Os Calcis, a Typical Injury in Building-Construction Workers. Experience with 230 Fractures of the Os Calcis** (Der Fersenbeinbruch—eine typische Verletzung des Bauarbeiters. Erfahrungen an 230 Fersenbeinbruechen). *Arch. f. orthop. Chir.*, 1937, 37: 649.

The special working conditions of the building-construction trade give rise to a great number of injuries resulting from falls and crashes. For this reason fractures of the os calcis are frequent. This report is based upon 230 cases which were treated during the course of seven years. As up to the present time there has been no study involving such a large number of cases of fracture of the os calcis, a somewhat detailed discussion is justified. Ninety-six per cent of the injuries resulted from a fall; 4 per cent were the result of direct trauma. The average height of the fall was 3 meters, the greatest 9 meters, and the smallest 1 meter. The average age of the patients was forty-four years and the ages varied from fifteen to sixty-nine years. One hundred and twenty fractures involved the right foot, 93 the left, and 17 were bilateral. In 108 cases the injury was a pure compression fracture, in 28 the fracture was horizontal in its course, and in 35 it was diagonal. In 25 cases there was infraction and fissure, for the most part only in the peripheral layer; in 16 cases there was a lateral tearing away, tearing of muscle insertions, and tearing-out of the Achilles tendon insertion. Complications of fracture of the os calcis, in the sense of simultaneous injury of other bones or subsequent thromboses, emboli, and fistulas, were observed in 39 cases. Every severe os-calcis fracture, especially when associated with simultaneous fracture of other bones deserves hospitalization. The fractures of Grades 1 and 2 in the classification following are best managed by ambulant treatment. Even more severe compression and splintering fractures can be treated conservatively in this manner if it is believed unlikely that more extensive measures will be required. The late results in this type of fracture are also satisfactory. Ninety-one of the less severe cases were treated conservatively. In this group the best results were obtained following the application of a well padded walking cast combined with a rubber or with a metal walking iron which was covered with wood, and used for a period of six weeks; the next best results were obtained in those cases in which a removable U splint without a metal walking stirrup was used. The latter type of dressing permitted the use of functional and physical methods of treatment immediately. The follow-up treatment is similar to that described in the cases of os-calcis fracture which were treated by hospitalization.

The 139 cases which were at first treated in the hospital and later in the ambulatory clinic were handled by the most variable methods. Data are presented concerning the results obtained in the groups treated according to the various methods and the amount of disability compensation which the patients obtained. The weight-bearing and walking ability can be restored at the termination of the treatment or even during the course of the latter by the employment of suitable orthopedic measures. In this respect cognizance must be taken of the fact that the largest number of the complaints have their origin in the lower ankle joint which is involved in some manner in every marked calcaneus fracture.

The author recommends a procedure which proved satisfactory in the last 41 cases treated. After ter-

mination of the treatment and the return of weight-bearing ability, as well as after the disappearance of circulatory disturbances, the patients received normal, solidly constructed shoes with Euplan arches, constructed according to the specifications of Lettermann. Although the serviceability of these is not beyond criticism, they are extremely good for calcaneus fractures, since in this type of fracture a secondary reduction due to final pathological bone and joint malposition does not come into question. The average duration of hospital treatment amounted to one and four-tenths months, and the average ambulatory treatment of all cases, also of those cases treated first in the hospital, was four and one-half months; in the latter group of cases the ambulatory follow-up treatment lasted four and four-tenths months, whereas in the cases treated entirely in the ambulatory clinic the duration of treatment was five months. A permanent disability compensation was received by 5.9 per cent of the patients with fractures classified as Grade 1, fissures, infractions, and sprained fractures; by 9 per cent of those with fractures of Grade 2, horizontal, longitudinal, and oblique fractures without deformity; and by 16.4 per cent of those with fractures belonging to Grade 3, compression or shattering fractures with severe deformity. Diagnosis without roentgen-ray examination may be extremely difficult. The films must always be taken from several angles.

(Blumensaat). Harry A. Salzmann, M.D

**Lagomarsino, E. H.: Treatment of Serious Fractures of the Os Calcis** (A proposito de las fracturas graves del calcaneo). *Rev. de ortop. y traumatol.*, 1937, 6: 365.

The author reports the results of 52 fractures of the os calcis treated during the last four years.

Under spinal anesthesia a Kirchner wire was inserted through the os calcis and one through the base of the metacarpals. The patient was placed on a Boehler traction frame and a 3-kilogram weight applied. Force was applied to the os calcis and the lateral displacement of the fragments corrected.

The longitudinal arch of the foot was corrected by manipulation, then a cast was applied from the ankle joint to the toes, transfixing the wires. The traction remained for twenty days. At the end of forty days the wires were removed, the cast

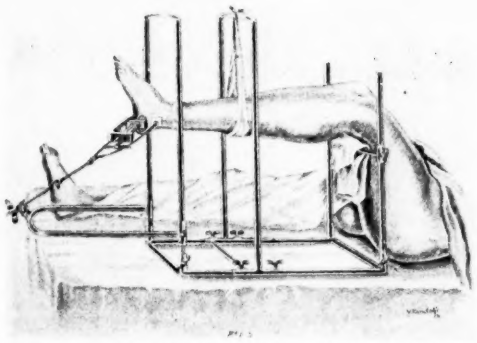

Fig. 1. Position for the reduction of fractures of the os calcis.

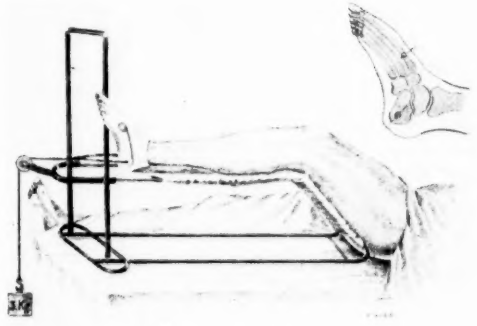

Fig. 2. After reduction. Control with plaster cast shoe and traction.

was changed, and the patient permitted to bear weight. The arch of the foot had to be well molded. In from sixty to ninety days physical therapy was begun and the patient wore a shoe with an elevated arch support.

The results from this method of treatment were excellent. Numerous films taken before and after reduction confirm the author's statement.

Carlo S. Scuderi, M.D.

# SURGERY OF THE BLOOD AND LYMPH SYSTEMS

## BLOOD VESSELS

**Liedtke, F. W.: Late Results of Traumatic Injuries to the Vessels** (Ueber Spaetfolgen tramatischer, Gefaessschaedigungen). *Arch. f. orthop. Chir.* 1937, 38: 114.

Temporary disturbances of the circulation frequently follow accidental injuries. The reasons for this are not wholly clear, least of all in the case of chronic disturbances or so-called traumatic edema. Investigations have, indeed, shown changes in the way of increased permeability of the vessels, and thrombus and aneurysm formation, all of which would give rise to disturbances of the circulation. It apparently makes no difference whether a venous or an arterial vascular region is mainly involved in the injury. It is much more difficult to explain the cases in which the disturbances appear as late results, after smooth healing of the immediate effects of the injury. When persons with such disturbances complain or present traumatic edema, they are often regarded as malingerers who have artificially produced in themselves the outward appearance of internal injuries, or as neurotics. In coming to such a conclusion, one should exercise great caution, for histological investigations on amputated limbs have thrown light on such complaints. In 1932 Braeuner reported two typical cases with complete case histories, and came to the conclusion that the trouble was a traumatic arteritis. In these cases the changes were in the arteries affected by the trauma, while the veins were wholly uninvolved.

Jakobi, Cerish, and Schaer and Neff have investigated the condition called traumatic arteritis. Liedtke reports 2 cases in which chronic edema appeared, in one case immediately following, and in the other case not until four weeks subsequent to a slight contusion, but undoubtedly in consequence of the contusion. These cases did not come to amputation. In a third case an abnormal reaction of the peripheral vessels was found to be caused by heating of the skin and mechanical irritation acting on the entire body. In 2 further cases not only a chronic edema but a gradually developing gangrene with intolerable pain, which necessitated amputation, followed injury, in one case without an interval, in the other case in the course of seven years.

Interesting facts were brought out by the histological examination. In both cases there was found a much canalized thrombus of the arteria dorsalis pedis and vessel changes both proximal and distal to, but never far from the site of injury; otherwise the vessels were intact. One point was particularly interesting: in both cases there was a circumscribed defect of the tunica elastica. In the opinion of the author this coat is the site of origin of the thrombus. He could discover no signs of inflammation. The cells in the media, which Braeuner held to be an indication of inflammation, are believed to be "abraumzellen" by Liedtke.

(Franz). Florence A. Carpenter.

**Holman, E., and Schulte, T. L.: The Treatment of Peripheral Vascular Disease by a Suction-Pressure Chamber Applied to the Thigh.** *Surgery*, 1937, 2: 502.

The authors note that, because suction on an obliterated rigid vascular tree cannot increase the blood supply unless there are available less rigid and less obliterated channels capable of responding to external influence, the results of improving peripheral circulation by alternating pressures are not always as permanent as might be desired. Moreover, unless the tissues are soft and pliable, the influence upon deeper structures and larger deeper vessels is minimal. The description of a suction-pressure chamber, designed by these workers to offset disadvantages of other available apparatus, is given in detail. The methods of treating patients and the observations made during a series of treatments are recorded.

From their experience with the suction-pressure chamber applied to the thigh, the writers find that it exerts its influence on vessels which are still patent and pliable instead of upon an obliterated or practically obliterated arterial bed. The former vessels are capable of responding to external influence, whereas the latter may not be.

The suction-pressure chamber can be applied in the presence of infection upon the foot without danger of spreading such infection by active massage. The healing of indolent, previously recalcitrant ulcers has been achieved under its treatment.

The thigh chamber proved its effectiveness in a case previously treated without benefit by the Pavaex boot. It is applicable when the Pavaex boot cannot be used because of the unbearable pain produced by the active massage of inflamed tissues.

The suction-pressure chamber is a peripheral or accessory "heart." During the negative pressure phase it draws blood into the thigh, and during the positive phase, it forces the blood into the peripheral vessels. It is applicable in obliterative vascular disease whether due to thrombo-angiitis or to arteriosclerosis. Herbert F. Thurston, M.D.

**Fiolle, J.: Arterial Emboli of the Extremities; A Pathological Study** (Les embolies artérielles des membres). *J. de chir.*, 1937, 50: 460.

Fiolle notes that arterial emboli may form without producing the typical clinical syndrome; in some cases the initial symptoms are those of embolism, but they subside; in others, the symptoms are never typical. He reports 2 cases of each type.

In the cases of the first type, the "abortive" embolus, the initial symptoms are due both to the

obstruction and to the reaction of the sympathetic nerve, which produces a vascular spasm, especially in the region of the embolus and below it. However, if the embolus is small and not infected the symptoms may subside as the collateral circulation becomes established and maintains the blood supply not only of the extremity, but also of the artery itself below the point of obstruction. In such cases the arterial obstruction may be incomplete or the embolus may not be firmly fixed and may migrate into the branches of the artery primarily involved.

But in the usual type of arterial embolism the pathological changes and resulting symptoms are progressive. The embolus, especially if infected, produces lesions in the arterial wall; these lesions do not involve the inner layers of the arterial wall so much as the adventitia. The intima shows some pathological changes, it is true, but the pathological changes in the adventitia are always more advanced; even the sheath of the artery may become involved. The sympathetic disturbances are aggravated.

Below the embolus the collateral circulation cannot maintain the normal flow of blood. Both the pressure and the speed of the blood flow are diminished; this results in extension of the clot, which thus obliterates a considerable segment of the artery and may destroy the function of a number of the collaterals. The lesions may become organized into a hard sclerotic block, but the symptoms persist, except in the case of "abortive" embolus, because of the reduction of the blood supply and defective circulation. The irritation of the sympathetic nerve plexus also persists, and it may be necessary to resect the entire obstructed vascular area. If the patient has an aneurysm or severe cardiac disease, the initial cause of the formation of the embolus, there is always danger that another embolus will form.

ALICE M. MEYERS.

**Funck-Brentano, P.: Arterial Emboli of the Extremities; Treatment** (Les embolies artérielles des membres. Traitement). *J. de chir.*, 1937, 50: 433.

Funck-Brentano notes that recent studies, especially those of Leriche, have shown that the arterial vascular system is not passive, and the effect of embolus is due not to mechanical obstruction alone but also to the fact that the thrombosed artery affects the sympathetic nervous system. Thus two methods of treatment have been developed: one which deals with the embolus itself, or anatomical method, and one which acts upon the arterial sympathetic system, or physiopathogenic method.

There are two anatomical types of treatment of arterial embolism, embolectomy and arteriectomy; the choice of one or the other depends primarily upon whether endarteritis has or has not developed. Endarteritis develops sooner or later at the site of the clot, and this is the area where a secondary thrombus is formed. It develops earlier if the clot is large or infected than if it is small and aseptic. The possible prolongation of the clot and its extent must also be considered in operations of this type.

In the treatment of embolism early and exact diagnosis is indispensable. The chief symptoms of arterial embolism of an extremity are sudden pain and pallor, and coldness and loss of cutaneous sensation in the limb below the embolus. Eventually gangrene develops. Embolism must be differentiated from phlebitis and arteritis. In cases in which there is doubt in regard to whether embolism or arteritis with obstruction due to arteriospasm is the cause of the symptoms, the acetylcholine test should be used, as this drug acts quickly on arterial spasm. In the larger arteries the site of the embolus can usually be determined by the clinical findings, such as the site of the pain, the changes in temperature, the signs of ischemia and arterial pulsation. In the cases of embolism in the smaller arteries, arteriography must often be done for the exact localization of the embolus; this procedure also has the advantage of showing the condition of the collateral circulation.

Of the various surgical methods of treatment, embolectomy is suitable only for those cases that can be operated upon within the first ten hours after the formation of the embolus. When this operation is performed this early it has often given remarkably good results.

After the tenth hour, arteriectomy is the treatment of choice; the resection of the artery should include the entire area that is in contact with the clot, and the adventitia should be removed. In cases of chronic embolism, previous removal of the embolus is not necessary; but in cases of acute occlusion by an embolus, a preliminary embolectomy should be done. Only in this way can the true conditions within the artery and the extent of the arteritis be determined. Arteriectomy results not only in the removal of the mechanical obstruction, but also in the removal of the focus of irritation of the sympathetic nerves, and, therefore, in the improvement of the collateral and peripheral circulation.

Operations on the sympathetic nervous system at a distance from the site of arterial obstruction and treatment with drugs, which also act upon the sympathetic nervous system, are not effective in the relief of arterial obstruction from an embolus. The use of such drugs, however, is often a valuable adjuvant to the operation of arteriectomy; for this purpose, the author prefers papaverine and acetylcholine, both given by intramuscular injection. Cardiac stimulants, such as digitalis, coramin, or camphor, may also be indicated according to the conditions in each case. ALICE M. MEYERS.

# SURGICAL TECHNIQUE

## ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

**Huzella, T.: The Micromechanical Basis of Wound Healing** (Mikromechanische Grundlage der Wundheilung). *Arch. f. klin. Chir.*, 1937, 188: 411.

The author seeks to fill in the gaps in our knowledge concerning the interpretation of the processes of wound healing by evaluation of his experiences with tissue cultures and the artificial production of filamentous structures. Following discussions clarified by photomicrographic pictures, but not suitable for a short report, the author comes to the conclusion that fibrin which arises from the bleeding or from the inflammatory exudate plays an important rôle in the primary provisional agglutination of the wound edges. This fibrin undergoes colloidal changes, the nature of which are not yet definitely known. In the later "constructive" phase of wound healing the elementary argyrophylic fibrous system is of basic significance in the formation of granulation tissue. It arises from the edematous collagen fibers present in the acid medium of the areas of inflammation and under the proper chemical requirements it takes form, depending upon the lines of force of the tension of the wound and also according to the pulling forces of the cellular activity. This thus becomes the basis of the "elastomotor micromechanism," which is active in the arrangement of the granulation tissue, in the cellular activity, and in the blood circulation between the latter and the regions surrounding the wound, and in the periodical process of the drawing together of the wound edges. The progressively more intimate relationship between the connective tissue system of the wound surroundings, which at first is separated from the granulation tissue, is brought about by the very lively cellular interaction. In the course of infiltration the granulation tissue is thus brought into the structural and functional unity of the organism. The active wound healing comes to a stop when the final scar has been formed. The difference between the theory of cellular pathology of Virchow and that of the molecular pathology of Schade is thus equalized to a certain degree by the union of the histological and colloidal chemical viewpoints into a uniform evaluation of the relationship between the cells and the fibrinous system into a sort of "intercellular pathology."

(Heinemann-Grueder). Harry A. Salzmann, M.D.

**Pozzan, A.: The Influence of Cod-Liver-Oil Ointment on Cicatrization** (Influenza della pomata all' olio di fegato di merluzzo sull' evoluzione dei processi di cicatrizzazione). *Arch. ital. di chir.*, 1937, 46: 459.

Pozzan reviews the literature on the effect of vitamins and particularly cod-liver-oil ointment on the healing of wounds, burns, fractures, and suppurative foci. Uncertainty still remains as to whether the recognized stimulating action of the ointment is due to the vitamin content or partly to other substances in the oil, the biological effect of which is undefined. Hence the author investigated the antiseptic action of the ointment and its separate components *in vitro*, the clinical effect on healing of wounds in rabbits and mice, and the histology of the reparative processes. His studies are the first made on the last subject. He performed control experiments to determine which of the components was responsible for its action.

The results showed that *in vitro* the action of the crude or the devitamized oil on staphylococci and colon and pyocyaneus bacilli differs according to the age of the culture. For young cultures the oil is mildly bacteriostatic and for old cultures, definitely bactericidal. Dilutions of the oil in vaseline are less effective, and vaseline alone is negative.

Numerous animal experiments with suitable controls showed that the oil dissolved in vaseline in the proportion of 1 to 3 hastened the healing of external wounds. The action was most marked in extensive and deep lesions involving much loss of tissue, and was increased when they were protected by a layer of gutta percha and a plaster bandage and the ointment was applied on alternate days for not too long a period. Although infection occurred, it was mild and localized.

The lesions treated with the ointment presented characteristic macroscopic and microscopic features. There was no sharp demarcation between the margins and base because of the rapid and uniformly distributed development of granulations in the center and the simultaneous extension of a continuous uniform epithelial layer from the periphery. No crust was formed. Reticulo-endothelial cells predominated over fibroblasts in the granulations, and polymorphonuclears were scarce. The capillaries proliferated actively and there were numerous blood and lymph sinusoids. At twenty days, continuity of the epithelium was reëstablished, with differentiation of the dermal and hypodermal layers and the beginning of hair follicles.

Vitamins A and D dissolved in vaseline retarded healing, as did vaseline alone. An ointment of cod-liver oil devitamized by heating and vaseline influenced cicatrization favorably, although more slowly than the normal oil.

Apparently, from the above experiments, the action of the oil is both antiseptic and stimulating. The antiseptic property is due to thermostabile substances; the stimulating, to both thermostabile and thermolabile substances. The lack of stimulating power in Vitamins A and D suspended in vaseline, and the mildly stimulating and bactericidal effect of the devitamized oil would exclude the vitamins as the chief source of the beneficial effects of the oint-

ment. Consequently the prevailing assumption of the specific and predominant importance of the vitamin content in cod-liver oil for wound healing remains doubtful.

Photographs, tables, and a bibliography accompany the article. M. E. MORSE, M.D.

## ANESTHESIA

**Woodbridge, P. D.: Metycaine Spinal Anesthesia.** *Am. J. Surg.*, 1937, 37: 191.

Metycaine is a water-soluble white powder which is not affected by air or sunlight. It is faintly acid, self-sterilizing, and does not deteriorate by autoclaving or any other form of sterilization. A skin wheal raised with a 1/16 per cent solution of metycaine lasted fourteen minutes as compared to the five minute skin anesthesia with a similar concentration of procaine. A 1/128 per cent solution of metycaine has anesthetic properties despite this great dilution. Metycaine is pharmacologically compatible with epinephrine and is superior to procaine for local anesthesia and topical application.

Metycaine can be obtained in 2 c.cm. ampoules of 10 per cent aqueous dilution. When it is mixed with spinal fluid, it is heavier than the spinal fluid. Within the first fifteen minutes after injection, the height of the anesthesia can be controlled by the slope of the operating table. After spinal puncture, the spinal fluid is aspirated into a syringe which contains the proper dose of metycaine, and is slowly reinjected into the subarachnoid space without barbotage. The quantities of metycaine used for various operative procedures are as follows:

For anesthesia of the perineum, from 0.4 to 0.8 c.cm. of 10 per cent metycaine diluted with from 1.5 to 3 c.cm. of spinal fluid, with the table level.

For anesthesia of the lower abdomen, from 0.8 to 1.4 c.cm. of metycaine diluted with 5 c.cm. of spinal fluid, with the head of the table tilted down 10 degrees.

For anesthesia of the upper abdomen, from 1.5 to 2 c.cm. of 10 per cent metycaine diluted with 5 c.cm. of spinal fluid, with the table inclined from 10 to 20 degrees.

In all cases, after the anesthetic height is reached the table is leveled. In this way, the anesthetic agent cannot travel cephalad by gravity. If the blood pressure falls to 50 per cent below its preanesthetic level, 0.2 c.cm. of 1 to 1,000 epinephrine solution is given intramuscularly. Respiratory embarrassment of any type is treated by the administration of oxygen by the closed method.

Spinal metycaine was administered in 1,381 cases. Of these, 70 per cent were treated by abdominal operation, which was confined to the upper abdomen in 21 per cent. Twenty-seven children between the ages of five and fourteen years were operated upon under spinal metycaine. They were given 1 mgm. per pound of body weight. Twenty-nine patients, more than eighty years of age, also received metycaine intraspinally. Six per cent of the total number of patients were classified as poor surgical risks and were given this anesthetic. The author believes, however, that poor risk patients should be given anesthetics other than spinal. The anesthesia was satisfactory in 90 per cent of the cases. In 99 per cent of the cases the anesthesia lasted over sixty minutes, and in 51 per cent the anesthesia still existed after one hundred minutes. Metycaine anesthesia wears off gradually, without the abrupt change to muscular rigidity which is so characteristic of procaine. An extremely great fall in the blood pressure was noted in 1.1 per cent of the patients; respiratory paralysis was present in 5.3 per cent of all patients; and retching and vomiting occurred in 3.2 per cent. However, the latter complication is not an index to the toxicity of the drug.

With regard to the immediate complications, only 3 patients had convulsions and 1 had a complete respiratory paralysis. The author believes that the 5 per cent respiratory and circulatory complications are dependent on the site and duration of the operation, as well as upon the age of the patient and the nature of the disease process. Neurological complications such as headache, anesthesia, hyperesthesia, backache, and weakness of the lower extremity constituted a very small number—only 2 per cent. Most of the neurological complications were purely functional and related to other etiological factors, such as extreme plantar flexion caused by tight bed clothes.

BENJAMIN G. P. SHAFIROFF, M.D.

# PHYSICOCHEMICAL METHODS IN SURGERY

## ROENTGENOLOGY

**Farberov, B. J.: Roentgenological Diagnostics of the Foramen Opticum.** *Acta radiol.*, 1937, 18: 594.

The author briefly reviews the literature on the subject of radiological investigation of the optic foramen. In the visualization of this structure, he prefers a modification of the technique of Goalwin. The patient is placed face downward on the proper cheek. The head is turned aside to 52 degrees, with the aid of an angle gauge. The exposure is made at a focal distance of from 52 to 60 cm. The following changes were found in various combinations:

1. Alterations in the form of the foramen, due to
   a. Congenital deformation
   b. Acquired deformation
2. Alterations in the dimensions of the foramen
   a. Enlargement of the channel lumen
      (1). Proportional, with retention of the original form
      (2). Non-proportional
   b. Decrease of the dimensions
      (1). Circular
      (2). Flattening of one diameter
3. Alteration of the outline of the foramen
   a. Thinning
   b. Partial or general thickening
   c. Breaking of the continuity of the outline
   d. Sulcus in the floor for the arteria ophthalmica
4. Complete destruction of the optic foramen
5. Alterations in the channel lumen (vertical or horizontal strip of calcification separating the lumen into two parts)
6. Alterations of the small wing of the sphenoid
   a. General thickening and condensation
   b. Pneumatization of the anterior clinoid process
7. Alterations of the sphenoid sinus and posterior cells of the ethmoid
   a. Diffuse shading
   b. Sclerosed cavities
   c. Distinctly confined shadows of tumors of rhinogenic origin
8. Alterations of the external orbital wall
   a. Thickening, hyperostosis
   b. Slit shaped and channel-shaped defects
   c. Fissures, fractures

Fig. 1. Unilateral darkening of one-half of the sphenoid sinus, of the posterior cells of the ethmoid labyrinth, and of the antrum of Highmore. Operation revealed a cystic tumor localized in the adjoining cavities.

Alterations of this type were observed in 21 per cent of 400 patients whose optic foramen was examined for one reason or another. In 8½ per cent of the investigated cases the normal picture of the foramen was of value in the diagnosis, particularly for the localization of the eye condition. The examination was particularly valuable in cases of retrobulbar neuritis, choked discs, optic-nerve atrophy, exophthalmos, trauma in the orbital region, and some indistinct visual disturbances.

The author concludes that examination of the optic foramen should be made more often. The foramen is accessible to any roentgenologist, but the examination requires strict adherence to a special technique. The interpretation of the roentgenograms demands a knowledge of the numerous wide variants of the norm. Comparative studies of both foramina is important. HAROLD C. OCHSNER, M.D.

**Bonola, A.: The Radiological Interpretation of Normal and Pathological Shadows of the Soft Parts of the Knee without Contrast Substances** (Sulla interpretazione radiografica delle ombre normali e patologiche delle parti molli del ginocchio senza mezzi di contrasto). *Chir. d. organi di movimento*, 1937, 23: 39.

Bonola states that the study of the shadows of the soft parts of the knee constitutes an unexplored field up to this date. Exact anatomical and pathological information is often necessary for diagnostic purposes and can be obtained relatively simply by the following radiological procedure:

No special technique is required, and the usual radiological material of the clinic is used for the illustrations. The knee should be exposed in frontal view and in profile at a flexion of about 140° and at a focal distance of 120 cm. For children the time of exposure varies between one and two minutes. The maximal tension employed was 50 kv. with an intensity of 80 ma. A double reinforced screen and an ultrarapid film were used. For the adult the time of exposure ranged from two to three minutes with a maximal tension of 60 kv and an intensity of 80 ma. A double reinforced screen, an ultrarapid film and a Potter Bucky diaphragm were employed.

Figure 1 shows the picture of a film obtained according to this technique, with a schematic interpretation of the shadows of the soft parts of a normal knee of a two-year-old child.

The author states that in general the distribution of the soft tissues in the knee may be compared to a

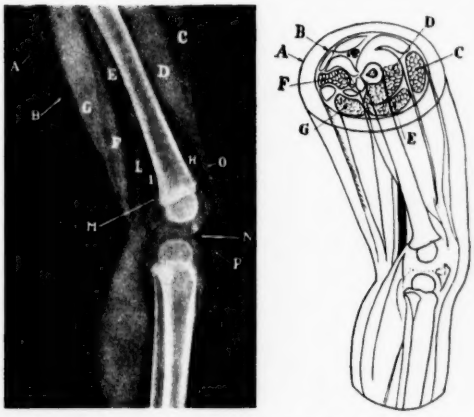


Fig. 1. Roentgenogram of the soft parts of the knee in a two-year-old child. A Skin and subcutaneous tissue. B Aponeurosis of the thigh. C Rectus anterior (rectus femoris). D Rectus femoris intermedius (rectus femoris). E Vastus lateralis. F Semimembranosus. G Long head of the biceps. H Retroquadricipital, radiotransparent space. I Popliteal adipose triangle. L Arteriovenous vascular bundle. M Insertion of the gastrocnemius and posterior capsular recess. N Subpatellar adipose cushion. O Quadriceps tendon. P Patellar tendon.

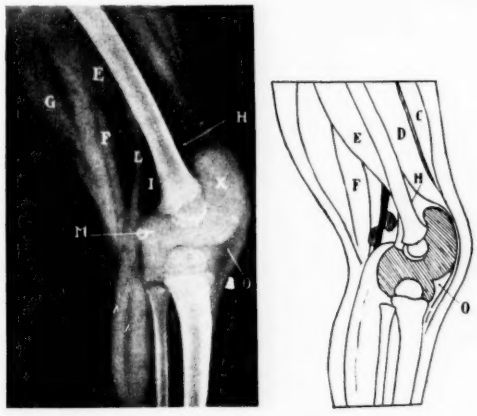


Fig. 2. M Posterior synovial recess distended by the effusion. X Subquadricipital recess is distended by the effusion and presents a well delimited contour.

series of concentric cylinders of varied structure and density having in their center a skeletal segment. The aponeuroses, muscles, tendons and even the blood vessels can be visualized in contrast with the adipose and areolar tissue which holds them together and forms a plane of cleavage between them.

John and Carty claim that it is possible to observe the course of the nerve especially in the popliteal region, but they have been unable to demonstrate it. Neurography, in the author's opinion, is only possible following the injection of a contrast substance into the perineural sheath.

The author subsequently describes the normal anatomy of the soft parts of the knee as it is seen in these roentgen pictures.

Concerning the pathological conditions, Bonola states that practically all the lesions of the knee may produce grave alterations of the fine structure of the soft parts either directly, by effusions or infiltrations of the capsuloligamentous structure or indirectly, in the form of a muscular atrophy or mechanical compression.

Among a series of various pathological conditions Bonola shows a tuberculous effusion into the knee joint characterized by the distension of the subquadricipital space in a two-and-one-half-year-old child (Figure 2).

Figure 3 represents a tuberculous arthrosynovitis and Figure 4 shows the roentgenological aspect of a

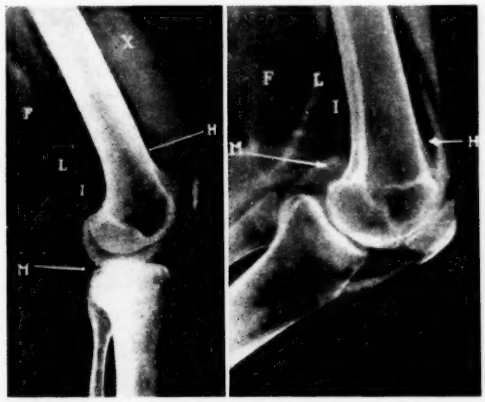


Fig. 3. Tuberculous arthrosynovitis in an eighteen-year-old girl. X Subquadricipital recess distended by the exudate. M Posterior capsular recess considerably distended by exudate.

Fig. 4. Arthritis deformans in a forty-year-old woman, showing marked atrophy of the soft parts and calcification of the posterior capsular recess M.

case of arthritis deformans with marked atrophy of the soft parts and calcification of the posterior capsular recess.

The author concludes by stating that this method may prove to be of considerable aid in diagnosis, and that its application should also be attempted in other articulations which present a more complex anatomical structure. RICHARD E. SOMMA, M.D.

# MISCELLANEOUS

## CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

**Menville, J. G., and Archinard, J. J.: Skin Eruptions in Patients Receiving Sulphanilamide.** *J. Am. M. Ass.*, 1937, 109: 1008.

Four cases are reported in which there developed annoying but apparently not serious skin symptoms following the administration of sulphanilamide, namely, maculopapular eruptions, with intense itching over areas of the skin exposed to the sun. In one case the rash was associated with severe chills, fever, and a leucocytosis. In all the cases the rash and its associated symptoms disappeared within several days after the drug was discontinued.

The cutaneous eruptions are more likely to occur in patients receiving large doses of sulphanilamide when they are exposed to constant rays of the sun.

SAMUEL KAHN, M.D.

**Goodman, M. H., and Levy, C. S.: Eruption During the Administration of Sulphanilamide.** *J. Am. M. Ass.*, 1937, 109: 1009.

Two cases of toxic erythema of peculiarly limited distribution developed in the course of treatment with standard maximum doses of sulphanilamide. In one case there were hemorrhagic lesions, indicating probably that sulphanilamide has vasculotoxic properties.

It is possible that the eruptions represent an allergic cutaneous reaction to the drug.

Unless one is dealing with acute infections, the dose of sulphanilamide should be kept within moderate bounds. SAMUEL KAHN, M.D.

**Bucy, P. C.: Toxic Optic Neuritis Resulting from Sulphanilamide.** *J. Am. M. Ass.*, 1937, 109: 1007.

A toxic optic neuritis, or a toxic neuritis of any other nerve, has not previously been reported to occur in man as a result of the administration of sulphanilamide or of any of the related drugs.

A girl with osteomyelitis of the ilium was given sulphanilamide on three different occasions. On each occasion toxic manifestations appeared: headache, cyanosis, diarrhea, a choking sensation on the first two occasions, and a severe loss of vision due to toxic optic neuritis on the last occasion. The symptoms rapidly subsided after withdrawal of the drug.

It is likely that the simultaneous administration of ferrous sulphate with the sulphanilamide contributed to the patient's intolerance for the latter drug.

SAMUEL KAHN, M.D.

**Mottram, J. C.: The Production of Epithelial Tumors by Irradiation of a Precancerous Skin Lesion.** *Am. J. Cancer*, 1937, 30: 746.

Cramer reported that the administration of a large dose of radium to precancerous lesions in mice produced an inhibition or delay in the development of malignancy. The author suspected that the rays had actually destroyed the epidermis, and in order to investigate the problem, 80 mice were subjected to benzpyrene in benzene for seventy-five days and varying doses of gamma rays were given. These doses, however, were considerably smaller than those used by Cramer. Warts occurred much more frequently in the mice that received the greatest amount of irradiation. Malignancy occurred in the usual proportion and, again, most frequently in those receiving the larger dosages.

It is pointed out that this increased incidence of epithelial tumors following a non-destructive dosage of radium may be related to the clinical "stimulating dosage" of irradiation. Of greater importance is the danger of irradiating a precancerous lesion without completely destroying it.

If these tumors which arise here and there among the epithelial cells are due to mutations produced locally by irradiation, then they should be related numerically to the dose of gamma irradiation applied, and not at all to the dosage rate. Work is now under way to test out the mutation theory of cancer in this way. THOMAS C. DOUGLASS, M.D.

**Gates, O.: Cutaneous Metastases of Malignant Disease.** *Am. J. Cancer*, 1937, 30: 718.

Cutaneous metastases are important because of their accessibility, although this type of metastasis occurs less frequently than lymph-node and organ metastases. The distribution of metastases to the skin is of interest in regard to the mode of spread and because of the relation to the primary disease. The most widely placed tumors are the lymphomas and leucemias, which are more apt to be present on all parts of the body surface than other mesenchymal or epithelial tumors.

The gross appearance of skin metastases is not distinctive and they have been mistaken for such different lesions as tertiary syphilis, infected hair follicles, and the nodules of periarteritis nodosa. There are, however, certain characteristics which are helpful in differentiating secondary carcinomatous, lymphomatous, and leucemic skin tumors. Secondary skin tumors of carcinomatous and sarcomatous origin are discrete, rounded, or oval masses. Plaque-like forms rarely occur except in lymphoma or leucemia. Cancer *en cuirasse*, which corresponds to the diffuse form of leucemia, differs from the latter in that it is not a true metastasis, but rather a direct infiltration of the skin from a neighboring tumor. The tumors are usually moderately firm, and at first may be resilient. This is particularly true of the metastatic renal carcinomas which occur frequently in the scalp and are often mistaken for sebaceous cysts. Tumors secondary to breast carcinoma are more apt to be quite firm and

scirrhous. The overlying skin is usually movable, but may be adherent, and is often a deep pink or violaceous color; pigmentation is rarely seen; ulceration is fairly common in lymphoma and leucemia, but is rarely seen in other secondary skin tumors.

Metastases to the skin occur more often than has been supposed. In an autopsy series of 2,298 malignant tumors of various types, 2.7 per cent had metastases to the skin. The importance of metastases of the skin lies in the fact that they are not uncommonly the first evidence of the existence of malignancy and also of metastasis. Contrary to current belief, metastases to the skin do not always herald approaching death, but may precede the terminal event by months or even years. They are of limited value in prognosis since the behavior of the skin tumors does not necessarily indicate the rate of growth of the primary tumor.

JOSEPH K. NARAT, M.D.

**Eggers, C.: Cancer Surgery.** *Ann. Surg.*, 1937, 106: 668.

The author believes that irradiation is not the great panacea for cancer which it was originally proclaimed to be; he recognizes it as a valuable adjunct to surgery. He emphasizes the fact that many among the public who know or suspect that they have cancer fail to seek early surgical advice on the theory that cancer is an incurable disease. It is important that the pessimistic attitude of the public, as well as of medical men, prevailing at the present time, be superseded by a sane optimistic viewpoint.

It is emphasized that enlargement of lymph nodes draining a certain cancerous area does not necessarily mean involvement. Frequently, such enlargement is due to absorption of infectious material from an ulcerated lesion, rather than to invasion with cancer cells. It is a common observation, on the other hand, that nodes are frequently involved without being palpable before operation. If the primary lesion is removable, it is operable regardless of enlarged regional nodes, unless there be contra-indications, such as distant metastases or constitutional disease. An attempt should always be made to remove the primary lesion with the entire drainage field and its enlarged lymph nodes in one piece.

Several factors operate to bring about favorable results: (1) early diagnosis, (2) a favorable tumor (one which is not very cellular and consequently has little tendency to metastasize, or one that is radiosensitive), and (3) radical surgery performed with meticulous and painstaking care, with an attempt to remove the surrounding tissue well beyond the tumor and its local extensions, as well as the complete lymphatic drainage area.

The author discusses his own results and those reported in the literature of various methods of treatment of cancer in different locations. He discusses the best surgical procedures in various types of growth. Of 21 patients with carcinoma of the sigmoid, he found 76 per cent to be operable; 31 per cent of those operated upon survived for five years. Of 63 patients with carcinoma of the stomach, 44 per cent could be treated by resection, and in 33 per cent he obtained a five-year cure. These figures are in fair agreement with the findings of Balfour, who reported resection in 45 per cent of 4,793 cases, and obtained five-year cures following lymph-node involvement in 18 per cent, and five-year cures when there had been no lymph-node involvement in 48 per cent.

With the present state of our knowledge concerning intra-oral cancer, radical block dissection of the neck offers the patient the best chance of cure. The primary lesion should be removed first. With regard to cancer of the breast, the author reports a five-year follow-up of 95 per cent of 76 cases. Of the patients without lymph-node involvement, 65.4 per cent survived five years; and of those with lymph-node invasion, 33.3 per cent survived five years. In the total group the five-year survival was 43.8 per cent.

The author believes that surgical treatment should be stressed in all those lesions which from the best combined surgical experience have been found to give better results with a carefully performed operation than with other forms of treatment. It should also be employed in all those lesions that may yield to irradiation, in which the results of treatment as regards pain and tissue damage are such that the patient is left in a worse condition than after surgery. The author believes that a combination of irradiation treatment and surgery should not be deliberately planned in advance as a curative measure, since in his opinion, it tends to encourage incomplete surgery.

HAROLD C. OCHSNER, M.D.

## GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

**Schulten, H.: The Problem of Sepsis** (Zur Sepsisfrage). *Med. Welt.*, 1937, 1: 633.

Schulten endeavors to outline a more definite conception of sepsis. Lexer wants to exclude this conception of sepsis as it does not conform with the classical interpretation of the subject; but the author considers this opinion as an evasion of terminology. It is wrong to classify sepsis as being equivalent to toxemia. Every febrile angina and every febrile furuncle produces general toxic symptoms. Regarding sepsis and bacteriemia as synonymous is also untenable. Bacteria are often found in the blood, even in harmless inflammations, without producing any general symptoms. We must adopt Schottmueller's definition: sepsis is present when the germs from an infective focus are constantly present or are regularly occurring in the blood coming from either a suppurative thrombophlebitis or a lymphangitis. Therefore, he differentiates between a sepsis thrombophlebitica and a sepsis lymphangitica. Metastases are rather unusual in comparison with the occurrence of bacteria flooding the blood; the proportion of the two conditions is 1 to 500. When merely a local metastasis occurs, it cannot be considered a sepsis. Local infections with occasional bacteriemia must be definitely differ-

entiated from sepsis. Even when a local inflammation spreads continuously to contiguous tissues, no sepsis can be diagnosed. Only when a larger vein or a larger lymphatic chain is involved, general symptoms of sepsis are in the foreground of the clinical picture and overshadow the local focus. Sepsis is a bacterial vascular focus which must be attacked surgically. It is important to note that the sepsis-focus seldom coincides with the primary focus.

Lexer endeavors to separate the pyogenic infections from the anaerobic infections. This is possible in tetanus only, but not in gas-bacillus infections and especially not in streptococcus putrificus anaerobic infections which, numerically, are scarcely less important in thrombophlebitic sepsis than hemolytic streptococcus infections. The anaerobic streptococci cause regular putrefaction in the veins as well as metastases and, at the same time, cause a putrid albuminous disintegration.

Regarding the metastases, he points to the investigations of Nathan who claims that metastases affect only the capillary beds nearest to the septic focus; hence, in peripheral phlebitis, the lungs; in pylephlebitis, the liver; and only later can they extend beyond to the next capillary chain because of pyogenic thrombophlebitis of the metastases. The anaerobic streptococci chiefly cause the foul lung abscesses; the hemolytic streptococci mainly produce the joint and skin metastases which are relatively benign and heal spontaneously after the removal of the focus of infection. Staphylococci tend to produce manifold metastases to numerous organs; in colon-bacillus sepsis sometimes all secondary suppurations are absent. Pneumococcal infections often lead to solitary bone, joint, or cerebromeningeal metastases. In addition to these, naturally, there is a sepsis acutissima in which section does not disclose anything excepting the inflammatory focus.

(Franz). Mathias J. Seifert, M.D.

## SURGICAL PATHOLOGY AND DIAGNOSIS

**Bannick, E. G., Gregg, R. O., and Guernsey, C. M.: The Erythrocyte Sedimentation Rate.** *J. Am. M. Ass.*, 1937, 109: 1257.

The authors summarize their article as follows:

1. If the sedimentation test is to have widespread use in the physician's office as well as in the hospital, the test must be simple.

2. Such a simple test is entirely adequate for practical purposes if certain facts are kept in mind. If a single reading is taken at the end of one hour, a tube such as the Westergren tube, which is 200 mm. tall, should be used. Shorter tubes may require more frequent determinations if the true rapidity of the sedimentation process is to be determined. The tube must be kept in a strictly upright position. Anemia tends to accelerate the rate of sedimentation, and allowance must be made for this fact; but a routine correction for anemia in each case is unnecessary.

3. The practical value of the determination of the sedimentation rate in general medicine is threefold: (1) it indicates the presence of disease; (2) it indicates the activity and progress of diseases such as tuberculosis, pelvic inflammatory disease, acute cholecystitis, rheumatic fever, infectious arthritis, pneumonia and other thoracic infections and suppurations, Hodgkin's disease, acute febrile illnesses, and acute coronary thrombosis; and (3) it aids in differential diagnosis. It is of particular value in the differential diagnosis of arthritis, and in that of acute appendicitis from abdominal conditions, such as acute pelvic inflammatory disease.

4. When the use of the sedimentation test is restricted to those cases in which it has its chief clinical value, and when the limitations of the test are recognized, it will continue to be an extremely valuable laboratory aid in clinical medicine.

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